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November 1, 2011

Brandon Perkins, Task Monitor United States Environmental Protection Agency 1200 Sixth Avenue, Mail Stop ECL-112 Seattle, Washington 98101

Re:

Contract Number: EP-S7-06-02

Technical Direction Document Number: 11-04-0001

Final Fourth Avenue and Gambell Parking Lot Preliminary Assessment Report

Dear Mr. Perkins:

Enclosed please find the Final Preliminary Assessment report for the Fourth Avenue and Gambell Parking Lot which is located in Anchorage, Alaska. If you have any questions regarding this submittal, please call me at (206) 624-9537.

Sincerely,

ECOLOGY AND ENVIRONMENT, INC.

endo E. Catello

Linda Costello

cc:

START-3 Project Leader

Derek B. Pulvino, Project Manager, E & E, Seattle, Washington

USEPA SF

Preliminary Assessment Report Fourth Avenue and Gambell Parking Lot Anchorage, Alaska

October 2011

Prepared for: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

1200 Sixth Avenue Seattle, Washington 98101

Prepared by: ECOLOGY AND ENVIRONMENT, INC.

720 Third Avenue, Suite 1700 Seattle, Washington 98104

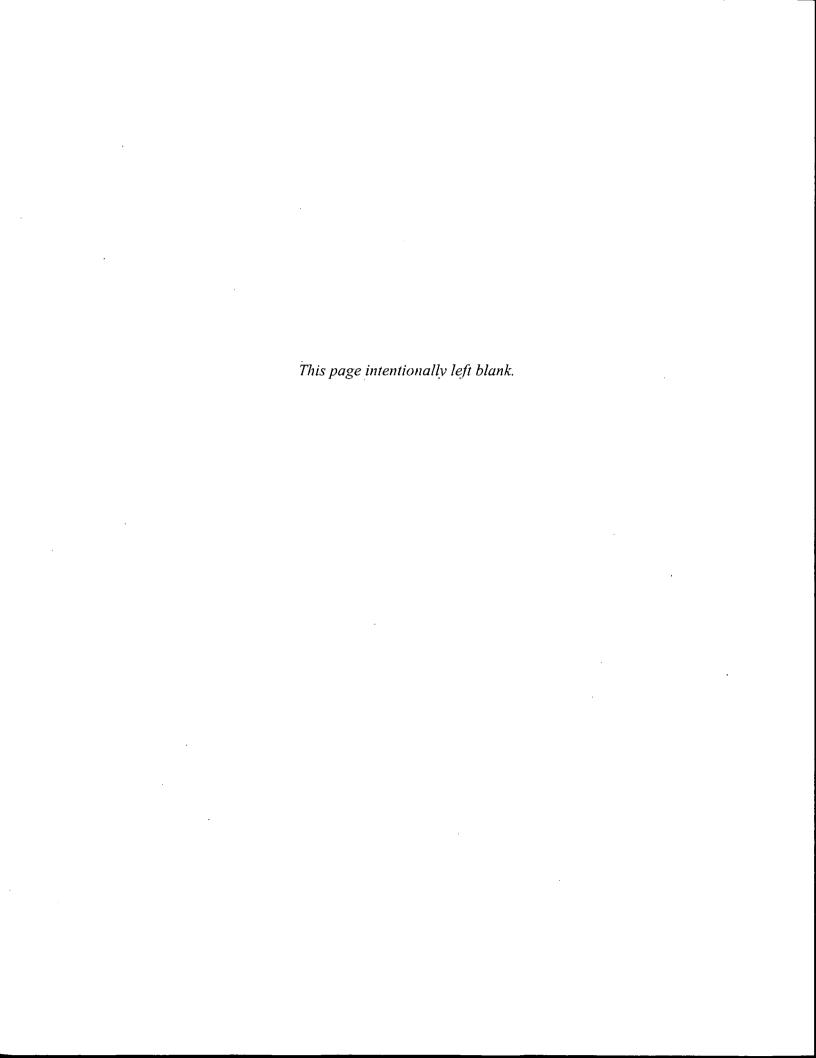


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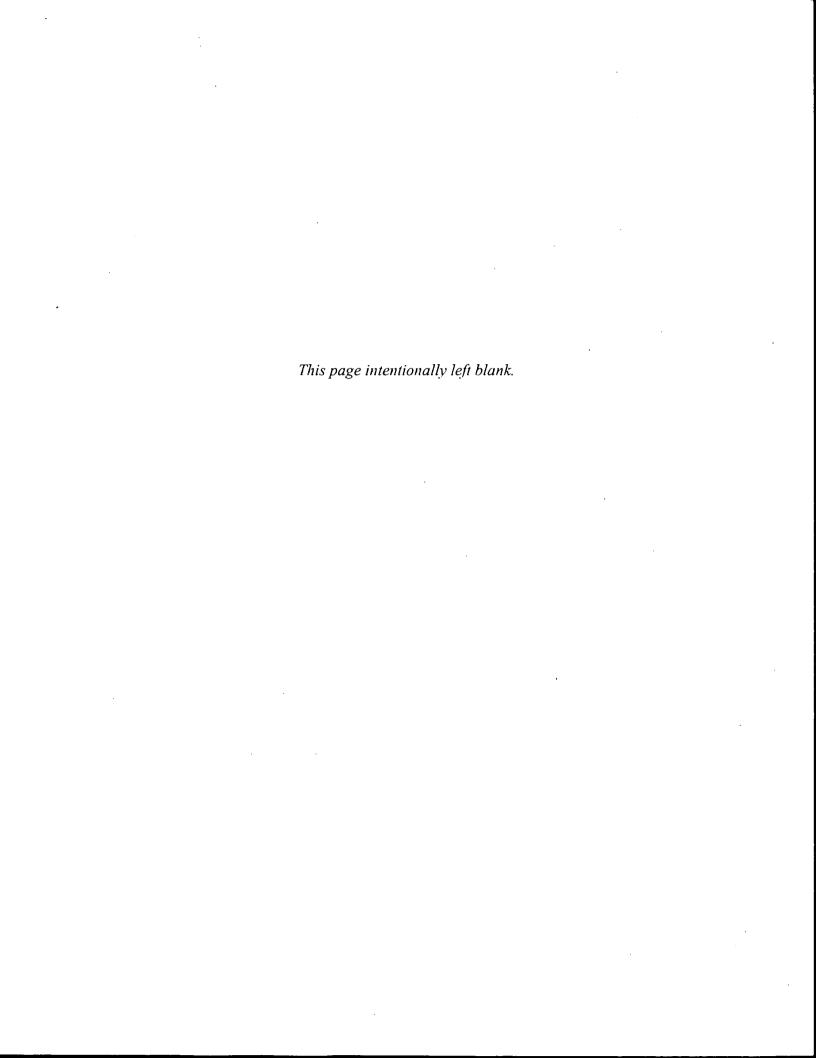
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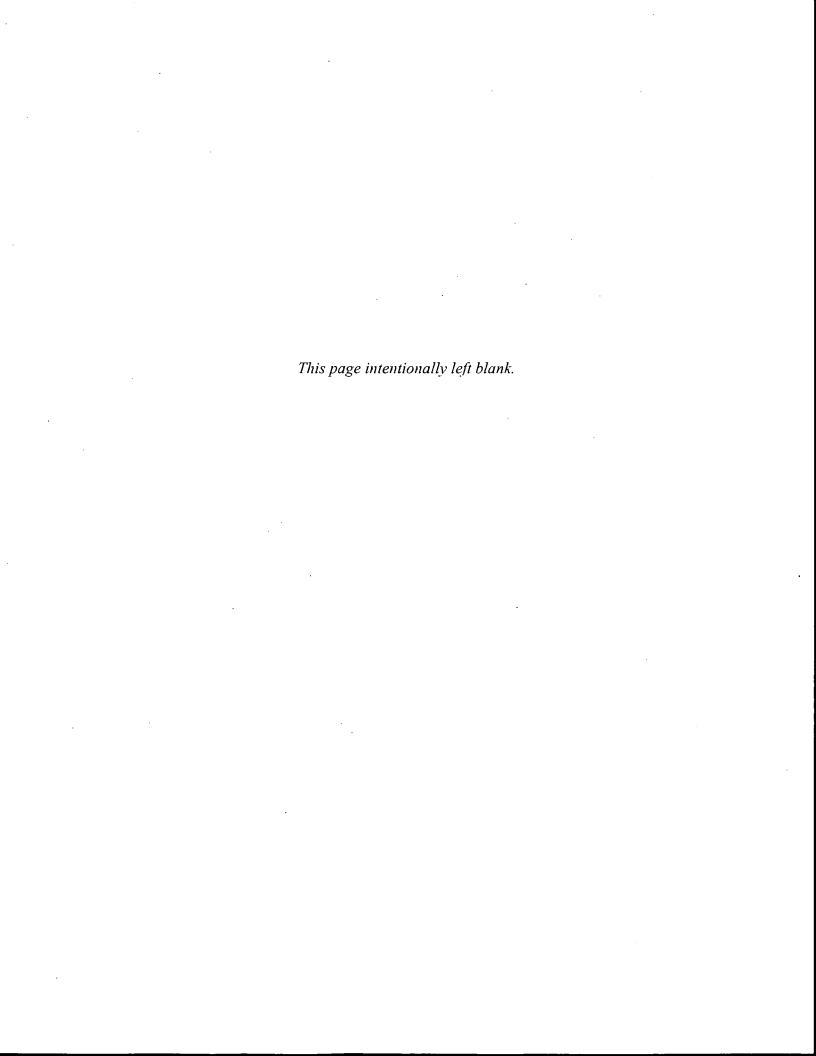
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List of Abbreviations and Acronyms

<u>Acronym</u>	Definition
ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
AOC	Administrative Settlement and Agreement and Order on Consent
AMA	Anchorage Management Area
ANH	Alaska Native Hospital
ARRC	Alaska Railroad Corporation
AWWU	Anchorage Water and Wastewater Utility
BGES	BGES, Inc.
bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CH2	CH2M Hill
DRO	Diesel Range Organic
E & E	Ecology and Environment, Inc.
EA	Environmental Assessment
EPA	United States Environmental Protection Agency
ESA	Phase II Environmental Site Assessment
EPMI	Environmental Project Management, Inc.
FEMA	Federal Emergency Management Agency
FGPL	Fourth Avenue and Gambell Parking Lot
GCL	Ground Water Cleanup Level
GRO	Gasoline Range Organics
MA	Management Area
MOA	Municipality of Anchorage
NCES	National Center for Education Statistics
NMA	Northern Cook Inlet Management Area
Oasis	Oasis Environmental

List of Abbreviations and Acronyms (cont.)

<u>Acronym</u>	<u>Definition</u>
PA	Preliminary Assessment
PCE	Perchloroethylene/Tetrachloroethylene
PID	Photo Ionization Detector
ppb	Part per Billion
ppm	Parts per Million
PPE	Probable Point of Entry
PW	Public Works
RI/FS	Remedial Investigation/Feasibility Study
RRO	Residual Range Organics
TR	Terminal Reserve
SCL	Soil Cleanup Level
START	Superfund Technical Assessment and Response Team
TCE	Trichloroethylene
TDL	Target Distance Limit
VC	Vinyl Chloride
USDA	United States Department of Agriculture
USDOC	United States Department of Commerce
USFWS	United States Fish and Wildlife Service
USGS	United States Geologic Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
WELTS	Well Log Tracking System
WRCC	Western Regional Climate Center

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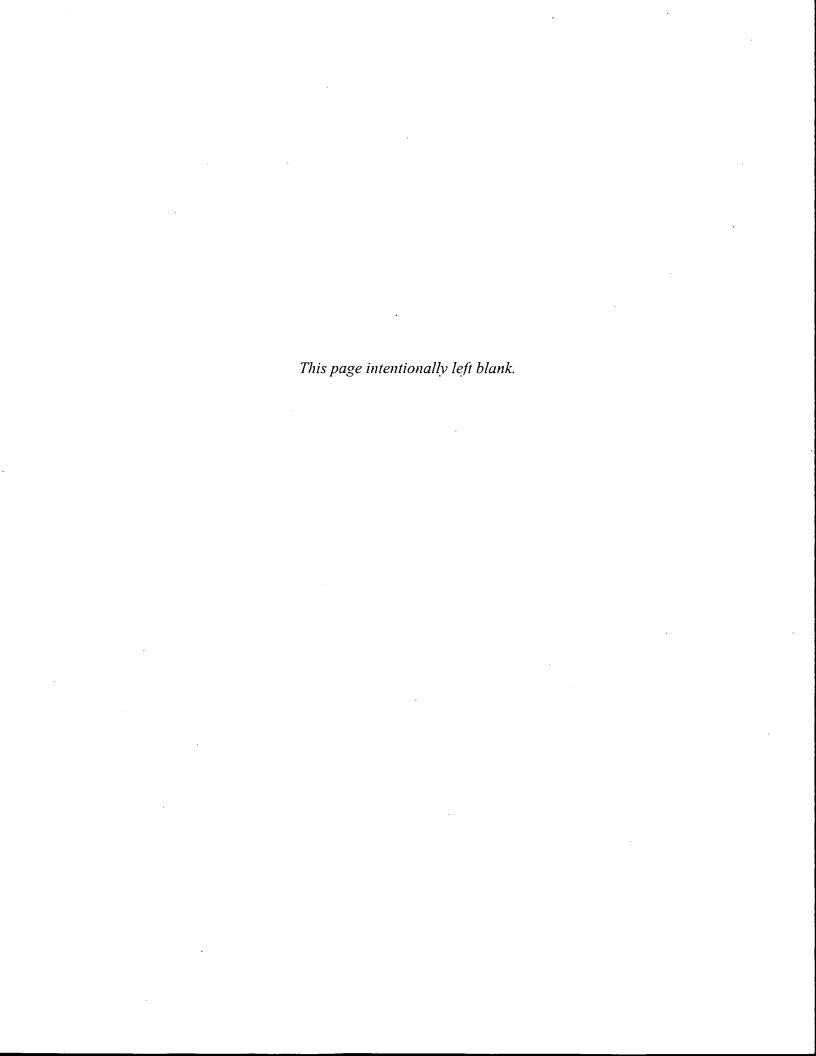
Introduction

Ecology and Environment, Inc., (E & E) was tasked by the United States Environmental Protection Agency (EPA) to provide technical support for completion of a Preliminary Assessment (PA) at the Fourth Avenue and Gambell Parking Lot (FGPL) site in Anchorage, Alaska. E & E completed PA activities under Technical Direction Document Number 11-04-0001, issued under EPA, Region 10, Superfund Technical Assessment and Response Team (START)-3, Contract Number EP-S7-06-02.

The specific goals for the FGPL PA, identified by the EPA, are:

- Determine the potential threat to public health or the environment posed by the site;
- Determine the potential for a release of hazardous constituents into the environment; and
- Determine the potential for placement of the site on the National Priorities List.

Completion of the PA included reviewing existing site information, collecting receptor information within the range of site influence, determining regional characteristics, and conducting a site visit. This document includes a discussion of background site information (Section 2); a discussion of migration/exposure pathways and potential receptors (targets) (Section 3); a summary of site information and conclusions drawn from this information (Section 4); and a list of pertinent references (Section 5).



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Site Background

2.1 Site Location

Site Name:	Fourth Avenue and Gambell Parking Lot
CERCLIS ID Number:	AKN001002925
Site Address:	717 East 4 th Avenue
Latitude:	61° 13' 7.81"
Longitude:	-149° 52' 11.95"
Legal Description:	Section 18, Township 13 North, Range 3 West,
_	of the Seward Meridian
County:	Municipality of Anchorage Borough
Congressional District:	At Large
Site Owner(s):	The Fourth Ave Gambell, LLC
	c/o Yvonne Anderson (Manager)
	8219 Sundi Drive, Anchorage, AK 99502
	907-243-4754
Site Operator(s):	Not provided
Site Contact(s):	Not provided

2.2 Site Description

The FGPL is located within the downtown core of the City of Anchorage, Alaska, approximately 1.3 miles east/southeast of the Cook Inlet's Knik Arm (Figure 2-1). Apart from a cellular communications tower and associated equipment located on the southeast corner of the property, the site is undeveloped and used only as a gravel surfaced parking lot. Property east, south, and west of the site is primarily retail and commercial; Hyder Street, 4th Avenue, and Gambell Street border the site to the east, south, and west (respectively). Property directly north of the site is residentially occupied with a variety of single- and multi-family residences; 3rd Avenue and the former Alaska Native Hospital (ANH) property are located in increasing distance beyond those residences (Figure 2-2).

The FGPL property includes four lots (8A, 10, 11, and 12) on Block 26A of the East Addition to the Townsite of Anchorage (Figure 2-2). These lots are further defined as Assessor Parcel ID Numbers 002-093-08-000, 002-093-07-000, 002-093-50-000, and 002-093-51-000. The property includes a total of approximately 40,600 square feet of land (Municipality of Anchorage [MOA] 2011) located on a relatively flat topographic plateau, approximately 110 feet above mean sea level. Apart from a cellular communications tower located on the southeast corner of the site, the subject parcels are currently undeveloped.

As will be discussed in more detail later within this document, soil and ground water impacts have been documented as extending from the four FGPL parcels onto the northern adjacent parcels (Oasis Environmental [Oasis] 2008). The FGPL site has also been named as a potential contaminant source for ground water impacts identified approximately 1,300 feet north of the site on the Alaska Railroad Corporation (ARRC) property along Ship Creek (Figure 2-3). Those impacts reportedly extend from the site, across the ANH property (CH2MHill [CH2] 2008), and may reach Ship Creek (ENSR/AECOM 2008).

2.3 Ownership History

The site is currently owned by "The Fourth Avenue Gambell, LLC" organization. When work was performed on the site in 2005, it was owned by Mr. Paul Maney (BGES, Inc. [BGES] 2005). Further information on previous owners of the site was not included in records provided on-line by the MOA or in earlier site investigation reports

2.4 Operations and Waste Characteristics

The site is a predominantly undeveloped and unpaved area used for parking. A communications tower/antennae used by Alaska Communication (BGES 2005) is the only other improvement currently located on the site.

Prior to these current land uses, the property appears to have been occupied by three buildings. Occupants of those structures included C and K Cleaners from 1968 to 1970, located on the west side of the property, and NC Tire Center from 1976 to 1978, located in two structures on the eastern portion of the site (Figure 2-2; Oasis 2008). By 1978, all of the buildings located on site were demolished. C and K Cleaners appears to have operated as a dry cleaning business, with NC Tire Center engaged in vehicle service work.

Operating dry cleaning facilities typically utilize chlorinated solvents, cleaners, and other detergents during the garment washing process. Automotive and vehicle service businesses also can use solvent baths that include chlorinated and stoddard solvents. During automotive repair operations, compounds either utilized or generated in the waste stream can include a variety of petroleum products (gasoline, diesel, motor oil, hydraulic oil, grease), brake fluid, antifreeze (ethylene glycol), heavy metals, and waste oils. Data regarding site occupants prior to 1968, or specific operational or disposal practices, permits, or releases related to the two identified historic site tenants were not included in available background reports.

2.4.1 Sources

Cleanup levels referenced hereinafter within this report refer to the Alaska Department of Environmental Conservation (ADEC) Method 2 guidelines recorded in 18 AAC 75.341 for zones that receive less than 40 inches of



precipitation annually. For the soil cleanup level (SCL), the most restrictive of the migration to ground water, ingestion, and inhalation pathways were utilized for individual compounds. For the ground water cleanup level (GCL), Table C of 18 AAC 75.345 was used. This approach is consistent with that used by Oasis in 2008, the most recent investigator at the site.

Based on information included in reports for the FGPL property, four sources have been identified as follows:

Wood/Log Cribs:

- One 8-foot-square "wood crib" buried "approximately 12 feet below the ground surface" (bgs) was encountered during excavation activities by Environmental Project Management, Inc. (EPMI) on the west side of the former NC Tire Center property. This crib was plumbed to "underground collection sumps" identified near the hoists in the NC Tire Center building. Analysis of one of the samples collected from material in the crib revealed perchloroethylene (PCE) (4.5 parts per million [ppm]); cis-1,2-dichloroethylene (0.8 ppm); 1,2,4-trimethylbenzene (178 ppm); 1,3,5-trimethylbenzene (49.5 ppm); toluene (9 ppm); n-butylbenzene (19.8 ppm); sec-butylbenzene (15.6 ppm); arsenic (9 ppm); cadmium (20 ppm); chromium (27 ppm); and lead (996 ppm) at concentrations in excess of SCLs (EPMI 1997).
- A second "log crib" was identified on the east side of the former C and K Cleaners facility. Analysis of the single soil sample collected from near this crib revealed PCE (1.0 ppm) at a concentration in excess of the SCL. Arsenic, barium, chromium, mercury, and lead were also detected in this sample, but at concentrations below SCLs. The size of this crib was not provided (EPMI 1997).

Buried Drums:

■ Four buried drums "marked for use in dry cleaning" were encountered during exploratory trenching near the former C and K Cleaners. Analysis of soil collected from near these drums revealed PCE (3.2 ppm) concentrations in excess of the SCL. The four drums were reported to be empty; however, the fate and/or size of the drums was not documented (EPMI 1997)

Contaminated Soil:

 An area of PCE contaminated soil that extends across the majority of the FGPL site and onto the northern adjacent residential properties has been confirmed. These soil impacts are located within an approximately 80,830-square-foot area, extending to the ground water interface at approximately 40 feet bgs (Oasis 2008).



2.5 Previous Investigations

Seven separate phases of environmental work have occurred at the site between 1993 and 2008. A summary of this work is provided below in chronological order. Several of the reports relating to this work were not available for review. In these cases, the summaries provided below rely on background information contained in the body of reports prepared by BGES in 2005 and Oasis in 2008.

2.5.1 Environmental Assessment

In 1993, an Environmental Assessment (EA) was conducted on the FGPL property by EnviroAmerica, Inc. According to the EA report, the property had been occupied by C and K Cleaners from 1968 to 1970 and NC Tire Center from 1976 to 1978. In 1978, those buildings were removed and the site was converted to its current parking lot use. An underground storage tank (UST) "vent pipe was visible on the property" (Oasis 2008). The EA also documented the potential presence of USTs in the northeast and north-central portions of the site. The contents of those tanks were not reported (BGES 2005). Neither Oasis nor BGES discussed the purpose of the EA.

2.5.2 Initial Site Characterization and Subsurface Investigation In 1997, EPMI completed an Initial Site Characterization and Subsurface Investigation Report for the FGPL site. EPMI was "contracted to conduct an investigation of potential environmental issues" at the site (EPMI 1997).

During this work, EPMI reviewed limited historic information, excavated multiple test pits across the site, and installed three monitoring wells. Excavation revealed the presence of three USTs and seven hydraulic hoists near the former NC Tire Center facility. Only six of these hoists were depicted on EPMI's site plan (Figure 2-4). Two of the USTs (1,000- and 500-gallon capacities) were "assumed" to store "heating oil." Although not depicted on their site plan, the third UST identified by EPMI was apparently a hydraulic oil reservoir attached to the lifts via an underground pipe network; the size of this UST/reservoir appears to have been approximately 200 gallons (EPMI 1997).

Although their locations were not identified on EPMI's site plan, multiple "underground" sumps were also observed proximal to the hydraulic hoists. These sumps were reportedly interconnected with below ground piping that led to a buried "wood crib" near the former NC Tire Center (Figure 2-3). EPMI assumed the crib was used for sewer disposal and discharge of rinse and wash water. As discussed above, analysis of soils sampled close to the top of this crib revealed the presence of PCE, cis-1,2-dichloroethylene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, toluene, n-butylbenzene, sec-butylbenzene, arsenic, cadmium, chromium, and lead at concentrations in excess of SCLs (EPMI 1997).

Several test pits/trenches were also excavated on the west side of the property, in the vicinity of the former C and K Cleaners. These explorations revealed a second "log crib" along with four buried drums marked for use in dry cleaning.



The log crib and drums appear to have been separated by more than 30 feet, with the drums encountered approximately 7 feet bgs. As discussed above, PCE was detected in soil samples collected in both of these areas at concentrations in excess of the SCL (EPMI 1997).

Finally, as part of their investigation, EPMI advanced three borings at the property to 45 feet bgs, completing each boring as a ground water monitoring well (MW-1, EPM-2, and EPM-3) (Figure 2-4). Only one soil sample was selected from these three borings for laboratory analysis based on field screening data with a photo-ionization detector (PID). Ground water was sampled from each well. These analyses revealed detectable volatile organic compound (VOC) concentrations in the well installed near C and K Cleaners (MW-1); however, only PCE concentrations in soil and ground water were in excess of their respective GCL and SCL (EPMI 1997).

EPMI's report did not document the fate of soil excavated in conjunction with this investigation (e.g., placed back in excavations, stockpiled, or sent off site). Likewise, the fate of the four buried drums containing dry cleaning solvent, the two log cribs, the encountered USTs, and the underground sump and piping network was not discussed.

2.5.3 Phase II Environmental Site Assessment and Ground Water Sampling

In the summer of 2004, BGES performed a Phase II Environmental Site Assessment (ESA) (BGES 2004a). Although BGES was aware that subsurface explorations had been previously undertaken by EPMI at the FGPL property, the findings of that investigation were apparently not provided to them or their client, Mr. Paul Maney (previous property owner). Mr. Maney was under the impression that EPMI's work involved the removal of "several USTs" and installation of "at least one monitoring well" (BGES 2005).

BGES' ESA included the excavation of six test pits; the removal of five hydraulic hoists; and the removal of four USTs (Figure 2-5). The four USTs were reported to contain hydraulic oil (two tanks) and heating oil (950 and 1,100 gallons). While the size of the hydraulic tanks was not specified, approximately 40 gallons of liquid were pumped from each tank prior to their removal. These tanks and hoists were associated with the former NC Tire Center building. The fate of the remaining two hydraulic hoists observed by EPMI in 1997 was not discussed. It should also be noted that the two heating oil tanks removed from the site were both located on the north side of the NC Tire Center building at a location where EPMI had identified only one tank. The second heating oil tank removed by BGES was apparently encountered in this area during tank removal. Likewise, the second hydraulic oil tank/reservoir removed by BGES was encountered during hoist removal excavation. No discussion was included in this report regarding the 500-gallon UST, underground sumps, wood cribs, or drums identified by EPMI (BGES 2004a).

An undisclosed volume of petroleum impacted soil was encountered upon removal of the hoists and USTs. Both diesel range organic (DRO) and residual range organic (RRO) concentrations in soil beneath the heating oil USTs were compliant with SCL. Soils beneath both hydraulic oil tanks and one of the removed hoists contained DRO and RRO at concentrations in excess of the SCL. The removed tanks and hoists, liquids pumped from the removed USTs, and both "clean and stained" concrete were sent for off-site disposal. Contaminated soil was stockpiled on site; its disposal was not documented (BGES 2004a).

During test pit explorations, one sample was collected from each of the six test pits. All of these samples were analyzed for gasoline range organics (GRO), benzene, toluene, ethylbenzene, and xylene (BTEX), DRO, and RRO. GRO was the only analyte detected and was present in the sample from TP-2 at a concentration compliant with SCL. Additionally, the three soils samples collected from the three western-most test pits (TP-1, TP-2, and TP-3) were submitted for VOC analysis by EPA Method 8260 (Figure 2-5). PCE was present at concentrations in excess of the SCL in all three samples. After receiving these analytical results, BGES asked the project laboratory to review the GRO analysis chromatograms for samples collected from the three eastern test pits for possible VOC contamination. These chromatograms revealed "evidence of PCE" in these samples (BGES 2004a).

In October 2004, BGES returned to the site to sample ground water from the one monitoring well that had been found on the property (MW-1, referred to as "EPM-1" in BGES' report). Apparently, BGES was not aware that two other wells were present. PCE was detected in this sample at a concentration "four orders of magnitude" above the "ADEC cleanup criterion" of 5 parts per billion (ppb) (BGES 2004b).

2.5.4 Phase II Environmental Site Assessment

In May of 2005, BGES presented Mr. Paul Maney with the results of a subsequent subsurface investigation undertaken to assess the soil and ground water quality at the property. Specific tasks included the advancement of three soil borings and the completion of these borings as ground water monitoring wells. These borings were advanced to depths of 45 (MW-2 and MW-3) and 50 feet bgs (MW-4), terminating at an underlying "clay layer" (Figure 2-2; BGES 2005).

A total of eight soil samples were selected from the three borings for VOC analysis by method SW-8260B. PCE was detected in all of these soil samples at concentrations above the SCL of 24 ppb. More specifically, concentrations ranged from 542 to 79,500 ppb. 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene also were detected in one soil sample collected from the borehole for MW-2; however, those concentrations were below SCLs (BGES 2005).

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Ground water samples collected from MW-1/EPM-1, MW-2, MW-3, and MW-4 were reported to contain PCE at concentrations ranging from 70.7 to 1,790 ppb, all in excess of the 5 ppb GCL (BGES 2005).

Based on the results of this sampling, PCE impacts were reported to be "aerially and vertically extensive," extending from 18 feet bgs to the water table at 40 feet bgs (BGES 2005).

2.5.5 Additional Site Assessment

BGES conducted a final round of sampling and testing at the site in 2007. That effort included advancing five soil borings (A, C, D, E, and F) and installing three monitoring wells (MW-5, MW-6, and MW-7) at, or adjacent to, the site (Figure 2-2). Between two and three samples were collected from all eight explorations, however soil samples from were collected from 0 to 2 feet bgs in only the soil boring locations. PCE was again detected in all of the soil samples at concentrations in excess of the SCL with PCE concentrations in the 0 to 2 foot samples ranging from 1.35 to 13.2 ppm. "J" data qualifiers were assigned to all of the data from shallow soil samples to indicate the results were "potentially biased low." Concentrations of PCE in ground water sampled from the three newly installed wells were also above GCLs (BGES 2007).

2.5.6 Site Characterization Report

In September of 2008, Oasis presented ADEC with their Site Characterization Report for the FGPL property. This work was undertaken on behalf of ADEC to "identify the nature and extent of contamination downgradient of 4th Avenue and Gambell Street," and included drilling six soil borings, soil screening and sampling, and sampling of temporary and permanent monitoring wells. All of these borings (SB-1 through SB-6) were advanced at off-site locations. One ground water and two soil samples were collected from each of these borings, and ground water on the FGPL site was sampled from the existing on-site monitoring wells (Figure 2-2). Both PID and Color-Tec samplers were used to screen for the presence of VOCs and chlorinated solvents, respectively. Screening with the Color-Tec devices revealed chlorinated solvents in surface soils at three locations (SB-2, SB-3, and SB-4). Fixed lab analysis of these soil horizons does not appear to have occurred (Oasis 2008).

Color-Tec screening was performed for 12 subsurface soil samples. Chlorinated solvents were detected in nine of these samples which were collected from soil borings SB-2, SB-3, SB-4, and SB-5. A total of 12 subsurface soil confirmation samples were selected for VOC, DRO, GRO, arsenic, barium, cadmium, and chromium analysis. The results of laboratory analysis largely correlated with field screening results, detecting PCE in 10 of the 12 samples, with concentrations ranging from 260 ppb to 54,000 ppb. The highest PCE concentrations were detected north/northeast of the C and K Cleaners property on the northern adjacent residential properties. PCE was not detected in the two soil samples collected from soil boring SB-1 which was positioned upgradient of the site on

the south side of 4th Avenue. Barium and total chromium were also detected in one soil sample, though the reported concentrations were within the "typical background" range for the Anchorage area. However, that "background" concentration was not specified. Neither GRO nor DRO were detected (Oasis 2008).

During this review, four ground water samples were collected from MW-5, MW-6, SB-1, and SB-2 and submitted for VOC, GRO, and DRO analysis. PCE was detected in three of the four samples at concentrations ranging from 290 to 1,600 ppb, all in excess of the GCL (5 ppb). Chloroform was the only other analyte detected; however, this detection was below the GCL (Oasis 2008).

Oasis concluded that "PCE impacted soil" was present north of the former C and K Cleaners. The furthest documented soil impacts occurred at SB-6, approximately 280 feet from the former C and K Cleaners (Figure 2-2). In that location, PCE concentrations in soil sampled from 32 to 32.5 feet bgs exceeded SCL. While soil "contamination" was present at the ground surface in several locations (SB2, SB3, SB4), it was concluded that a "significant mass of contamination occurs in a gravelly sand profile that begins around 15 feet bgs and extends to approximately 35 feet bgs" (Oasis 2008). That said, as no soil samples collected at the ground surface were submitted for laboratory analysis, Oasis appears to have inferred the presence of surficial "contamination" from field screening results.

Oasis has estimated the extent of PCE impacted soil in the vadose zone to be "broad," depicting an area of impact measuring approximately 315 feet by 360 feet in their report. However, the exact boundary of the contaminant mass is unknown. PCE concentrations in ground water were reported to "exceed the GCL underneath the entire area of the former C and K Cleaners," extend northeastward from the cleaners, and potentially extend "west of Gambell Street and north of 3rd Avenue." Vapor intrusion testing was recommended for the residences located on the northern adjacent parcels (Oasis 2008).

2.5.7 Additional Site Characterization Report

In June of 2010, Oasis presented ADEC with their Additional Site Characterization Report for the FGPL property. This work was again undertaken on behalf of ADEC "to determine the potential for vapor intrusion at four buildings located north of...[FGPL]...and to delineate the source area of vadose-zone and ground water contamination." This work included the collection of multiple indoor air, outdoor air, and soil vapor samples. Indoor and outdoor air samples were collected during four separate sampling events at the northern adjacent residential properties. Collection of soil vapor samples occurred on the AREPL property, the northern adjacent residential lots, the block occupied by PIP Printing and the Native Baptist Church to the west, and the southern approximately 270-feet of the former ANH property to the north (Oasis 2010).

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These efforts revealed the presence of PCE in soil gas samples collected from almost the entirety of the study area, including 48 of the 49 passive recovery soil gas samples collected on the FGPL and northern adjacent residential properties. Trichloroethylene (TCE) was also detected in the passive recovery soil gas samples collected from the area of and immediately surrounding the former C and K Cleaners location. Analysis of samples collected from air within the residences and their crawlspaces revealed PCE concentrations above ADEC indoor air target levels at all four residences; TCE and vinyl chloride (VC) were detected in these residences during one sampling event. PCE was also detected in five of the eight outdoor "ambient" air samples collected from two separate locations (AA-1 and AA-2) on the residential lots (Figure 2-2). PCE concentrations ranged from 0.26 to 2.3 micrograms per cubic meter. Finally, detectable TCE concentrations were present in one of these ambient air samples (February 2010, sample AA-2) (Oasis 2010).

2.5.8 Nearby Ground Water Investigation, Alaska Railroad Corporation

The ARRC Anchorage Terminal Reserve (TR) property is located approximately 900 feet north of the FGPL property and is a site that includes extensive environmental impacts (Figure 2-3). As related to those impacts, the TR site includes approximately 600 acres of land subject to an Administrative Settlement and Agreement and Order on Consent (AOC) between the EPA and ARRC. In satisfying the terms of the AOC, ARRC engaged the services of ENSR/AECOM to perform a Remedial Investigation/Feasibility Study (RI/FS) of the TR property (ENSR/AECOM 2008).

During the RI investigation, sampling and testing of the shallow unconfined aquifer revealed the presence of chlorinated hydrocarbons (e.g., PCE and TCE) and related breakdown products (e.g., VC) at multiple locations on the TR property (ENSR/AECOM 2008). In an area designated as "GW 2/3" and situated approximately 1,300 feet north of the FGPL property, chlorinated compounds detected in ground water included VC (Figure 2-3). The RI had not, however, identified a specific on-site source for these contaminants in the area of GW 2/3. As such, it was suggested that these contaminants may have originated at an off-site and upgradient source (CH2 2008).

On November 7, 2008, CH2 and E & E presented a memorandum summarizing the results of investigatory tasks undertaken to identify "off-site" sources potentially contributing to the VC impacted ground water at GW 2/3. That work began by reviewing the contaminated sites database maintained by ADEC for locations upgradient of GW 2/3 where chlorinated solvents and other petroleum hydrocarbons had been detected in the subsurface environment. The database research revealed six such potential off-site sources. Further review of ADEC file records pared the list down to two likely candidate sources: the FGPL site and the ML&P maintenance facility located at 1121 East 1st Avenue (CH2 2008).

Upon completion of file review, a total of 26 ground water samples were collected from areas upgradient of GW-2/3. Samples were collected from existing monitoring wells and temporary well points. All sampling points were selected and/or advanced to collect water from the unconfined shallow aquifer. Based on measurements of the relative elevation and depth to ground water at each sample location, ground water elevations and the flow directions were found to generally mimic the surface topography. As related to the FGPL site, ground water was found to flow north-northeast from the FGPL site, transitioning to a generally northwesterly flow in the Ship Creek valley (CH2 2008).

Sample analysis revealed chlorinated solvents in ground water at, and downgradient of, the FGPL property. Detections included elevated PCE concentrations extending northeast from the FGPL site, and across the former ANH site. Lower concentrations of PCE as well as related breakdown products (VC, cis-1,2-Dichloroethene) were also detected downgradient of the hospital property, with the breakdown products found to extend to Area GW-2/3. In combination with the information generated on the local ground water flow regime, analytical data were taken to suggest that the "PCE contamination at the [FGPL]... site" was "the source for vinyl chloride detected in ground water at Area GW-2/3." Neither the former ANH property nor the ML&P maintenance facility appeared to be contributing to these impacts (CH2 2008). This plume may reach Ship Creek (ENSR/AECOM 2008).

2.6 START Site Visit

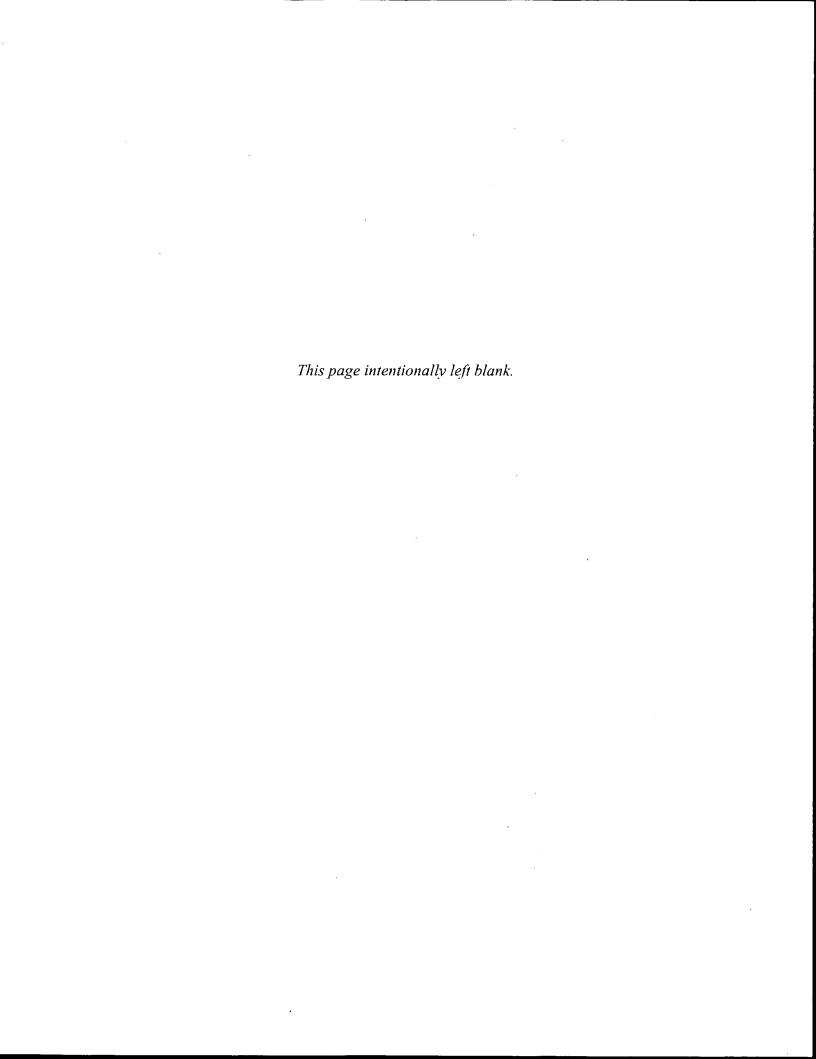
On July 18, 2011, START and EPA visited the FGPL property. Full, unguided access to the site and visible areas of nearby properties was provided. Photographs from site visit are included in Appendix A; observations were as follows:

- The subject property is an undeveloped, predominantly gravel covered lot. At the time of the reconnaissance, the western half of the property was utilized as an unpaid parking lot. Numerous potholes and puddles were noted on the property (Photos 19-22).
- Two separate concrete slabs were observed on the eastern portion of the site (Photos 3 & 4). Comparing the location of these slabs to site plans and historic aerial photos provided by others, these slabs appear to be associated with the buildings demolished in the late 1970's and last occupied by NC Tire Center. Apart from a cellular communications tower on the southeast corner of the lot, the eastern half of the site was otherwise undeveloped/unutilized.
- During the site reconnaissance, START was only able to locate five of the nine monitoring wells identified in Oasis' 2008 report. Two of these five wells appeared to be damaged. More specifically, there were no monument caps over MW-2 or MW-4, with MW-2's well cap apparently



separated from the well casing and visibly damaged (Photos 7 & 8). Wells MW-5, MW-6, and MW-7 all appeared to be in serviceable condition.

- Two catch basins were observed on the opposite side of East 4th Avenue, at the southeast corner of the intersection of East 4th Avenue and Gambell Street. The elevated centerline of East 4th is expected to minimize the flow of runoff from the site to those basins. Based on the local topography, runoff from the site is anticipated to flow into the adjacent curbside gutters, and then run north from East 4th Avenue, along Gambell and Hyde Streets. A stormwater catch basin is located at the southeast corner of Gambell Street and East 3rd Avenue.
- Multiple occupied residences and ground water monitoring wells were observed on the northern adjacent parcels of land (Photos 10 & 11).
- An automotive service business (Downtown Auto Repair) occupies the building and parcel west of the site. Given its corner location as well as the building's design and property layout, that facility may have previously operated as a gas station.
- The northern adjacent properties were occupied by several small attached and detached residential structures. Additional single-family residences were noted northwest of the site. The Native Baptist Church is northeast of the site (Photo 15).



3

Migration/Exposure Pathways

The following sections describe the migration/exposure pathways and potential targets within the site's range of influence (Figures 3-1 and 3-2).

3.1 Ground Water Migration Pathway

The target distance limit (TDL) for the ground water migration pathway is a 4-mile radius that extends from the sources at the site. Figure 3-1 depicts the ground water 4-mile TDL.

3.1.1 Geologic Setting

The City of Anchorage is located on a moderately broad lowland bounded on the east and southeast by the Chugach Mountains, by Cook Inlet to the west, and Knik Arm and Turnagain Arm of Cook Inlet to the north and south (respectively). Unconsolidated deposits in this area include glacial, alluvial, colluvial, and lacustrine deposits, rock glaciers, and landslides (Winkler 1990). The unconsolidated deposits were placed during multiple glacial and non-glacial geologic events, resulting in a complex, vertically discontinuous stratigraphy, measuring from 650-feet thick near Anchorage, to only several feet thick along the Chugach Mountains (Schmoll 1984). Bedrock has been encountered at depths of approximately 500 to 760 feet at locations within an approximately 2-mile radius of the site (Glass 1988).

Surface materials beneath the site and much of the surrounding area are quaternary glacial outwash deposits. These outwash deposits extend northeast from the shores of Bootlegger Cove at Turnagain Heights, through much of downtown Anchorage towards Eagle River and the lower slopes of the Chugach Mountains. Proceeding northeast from Turnagain Heights towards the Eagle River Valley, these materials grade from a "stratified fine sand...into coarse sand, cobbles, and boulders." In the area beneath Anchorage, "pebble gravel in lenses of 2 to 6 inches thick and 20 to 50 feet long alternates with lenses of coarse sand" (Miller 1959). These deposits are underlain by the Bootlegger Cove Formation, a glacioestuarine derived deposit comprised predominantly of clay with areas of interbedded silts and sands (Schmoll 1984). In subsurface explorations at the FGPL site, approximately 45 feet of fine- to coarse-grained sands and gravels were noted to overly a clay layer (Oasis 2008).

Basement formations include the Mesozoic and Tertiary age metamorphic rock that form the Chugach Mountains, and tertiary shale beneath the Anchorage



lowlands. This underlying bedrock unit also slopes down as one moves from the Chugach Mountains to the west (Cederstrom 1964).

The mean annual precipitation for Anchorage, Alaska, as measured at Merrill Air Field from November of 1997 to December of 2008, is 14.78 inches (Western Regional Climate Center [WRCC] 2011). On fully vegetated surfaces, the potential evapotranspiration is 20 inches, resulting in a net negative water infiltration potential (United States Department of Agriculture [USDA] 2001).

3.1.2 Aquifer System

Major aquifers for the Anchorage area extend from the Chugach Mountains across the Anchorage basin. These aquifers are replenished by surface water runoff from mountains, direct infiltration of precipitation, and percolation from surface waters (Cederstrom 1964).

Unconfined upper water bearing strata exist within the unconsolidated glacial deposits. Deeper, confined, and apparently interconnected aquifers under "artesian" conditions are also present beneath much of the Anchorage area (Cederstrom 1964). The northern margin of these aquifers is generally accepted to extend to the Elmendorf Moraine. The Bootlegger Cove Formation, a matrix of "dense, clayey silts," forms the "confining layer" separating the upper unconfined from lower confined aquifers (Brabets 1999). In a projected cross section drawn from the western shore of downtown Anchorage to the lower slopes of the Chugach Mountains, the Bootlegger Cove formation was inferred to be between approximately 80 and 144 feet thick in the cadastral section of the FGPL property (Schmoll 1984).

Although others have reported the Bootlegger Cove formation to "pinch off" in spots and allow for an interconnection between the confined and unconfined aquifers (Munk 2004), that work targeted an area approximately 6 miles southwest of the site. Earlier reports have also broadly referred to this confining member (i.e., Bootlegger Formation) as "leaky," resulting in head loss at distance from the recharge zone near the toe of the Chugach Mountains. Such connectivity was also thought to provide a means of infiltration from the unconfined aquifer to the "confined" strata near the Chugach Mountain, and for the confined aquifer to provide recharge to the upper, unconfined aquifer further from the mountains (Cederstrom 1964).

Regionally, ground water in both the confined and unconfined systems flows in a generally westward direction from the Chugach Mountains to Knik Arm and Cook Inlet (Patrick 1989). Shallow ground water in the immediate vicinity of the FGPL has been reported to flow in a generally north to northwesterly direction (CH2 2008)

3.1.3 Drinking Water Targets

The Anchorage Water and Wastewater Utility (AWWU) "satisfies most of the city's water demand" (United States Geologic Survey [USGS] 2006). This water system is an interconnected network supplied by multiple drinking water wells and surface water intakes. As of January 1, 2011, AWWU provided water to a total of 54,976 active water accounts (AWWU 2011b). In 2000, the average household size for the Municipality of Anchorage was 2.67 people (United States Department of Commerce [USDOC] 2001). Assuming a "one to one" ratio between water accounts and households, those connections would represent a total of 146,785 people using AWWU supplied water (i.e., 54,976 household x 2.67 people per household).

In 2010, AWWU provided a total of 8,401,087,667 gallons of water, with 92 percent of that supply coming from a single source located outside of the 4-mile TDL (Lake Eklutna). Of the remaining sources, only four wells (Wells 3, 4, 7, and 12) are located within the 4-mile TDL. Sampling of these wells was consistent with the requirements of all public drinking water supplies. Production from these wells in 2010 was reported as follows (AWWU 2011a):

- Well 3: This well provided no water in 2010 and has been out of service for approximately 10 years. Information regarding the reason for well closure was not provided by the AWWU.
- Well 4: 47,302,000 gallons, or 0.5 percent of the total water supply. This well is located approximately 1.5 miles from the site.
- Well 7: 64,502,000 gallons, or 0.7 percent of the total water supply. This well is located approximately 2.4 miles from the site.
- Well 12: 199,182,000 gallons, or 2.4 percent of the total water supply. This well is located approximately 2.6 miles from the site.

Based on this data, the following populations would be apportioned to these wells:

•	Total:	5,284.2	
	Well 12:	3,522.8	$(146,785 \times 0.024)$
•	Well 7:	1,027.5	(146,785 x 0.007)
•	<u>Well 4:</u>	733.9	(146,785 x 0.005)
•	<u>Well 3:</u>	0.0	(146,785 x 0)

In addition, the Alaska Department of Natural Resources (ADNR) "Well Log Tracking System (WELTS)" was reviewed for data on wells located within the 4mile TDL. While the information maintained by WELTS is searchable by Section, Township, and Range, WELTS does not provide a means to discern whether individual well logs are for ground water monitoring wells or drinking water supply. A total of 531 individual well logs are located in the cadastral sections within a 4-mile radius of the site (ADNR 2011). As confirmed during a telephone conversation with Mr. Roy Ireland of ADNR, determining whether these wells are monitoring or drinking water wells would require downloading and reviewing the individual well logs (Ireland 2011).

As per the TM's direction, and for the purposes of this PA, only well logs located in cadastral sections within a 0.5-mile radius of the site were reviewed. Based on this review, 13 of the 531 total well logs were found to correspond with locations within the cadastral sections within 0.5 mile of the site. Although five of these 13 logs represented drinking water supply wells, only two wells were confirmed to be located within 0.5 mile of the site; the others were outside 0.5 mile of the site. Based on a comparison of well logs, well construction data, and/or maps provided by AWWU, WELTS, and Cederstrom, one of these two wells appears to be "Well 3" of the AWWU. The second well is located approximately 0.5 mile northeast of the site and, as no further identifying or use information is available, it is assumed to service one household. Drinking water populations by distance ring are presented in Table 3-1.

Finally, multiple wellhead protection zones are present within the 4-mile TDL (ArcGIS 2011).

3.2 Surface Water Migration Pathway

The surface water migration pathway TDL begins at the probable point of entry (PPE) of surface water runoff from the site to a surface water body, extending downstream for 15 miles. Figure 3-2 depicts the surface water TDL.

The site is located at an elevation of approximately 110 feet above sea level on a relatively flat plateau within the downtown core of Anchorage, Alaska. In general, the broader area on which this plateau is situated gains elevation as one travels east from the Cook Inlet and Knik Arm towards the Chugach Mountains. This general topographic regime is broken by the low-lying, incised alluvial channels of Ship Creek and Chester Creek, located approximately 0.30 mile north and 1.2 miles south of the site, respectively. Those surface water courses drain from the Chugach Mountains to Knik Arm, flowing in generally westerly directions.

Based on the relatively flat topographic relief and urban setting of the site and vicinity, along with the presence of storm sewers in the adjacent right of ways, the upland drainage area is interpreted to be limited to the site itself.

Soils in this area are classified as urban cryorthents, a well-drained to extremely well-drained, moderately acidic, extremely gravelly, sandy loam that is nonsticky



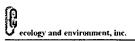
and nonplastic. Urban cryorthents can include 55 percent gravel and 10 percent cobbles (USDA 2001). As previously mentioned, the mean annual precipitation for Anchorage is 14.78 inches (WRCC 2011). The 2-year, 24-hour probable maximum rainfall event for the Anchorage, Alaska area is 1.5 inches (USDOC 1963). According to flood plain maps provided by the Federal Emergency Management Agency (FEMA), the site is located in the Zone X floodplain, an area defined to be outside the 100- and 500-year flood plains (FEMA 2009).

3.2.1 Overland Route

As discussed earlier, the site is located within downtown Anchorage, Alaska. Land in the vicinity of the site is a mixture of residentially and commercially developed property and asphalt paved parking lots, roadways, and alleys. Localized pockets of cleared and undeveloped land are generally north of the site. While storm drain catchment basins were observed on the opposite side of East 3rd Avenue, the nearest "down-gradient" storm drains are located approximately 130 feet north of the site, at the southeast corner of East 2nd Avenue and Gambell Street (Figure 2-2). It is anticipated that the majority of storm water and surface water present on and near the site would drain by way of the drainage catchments to the north.

Catch basins in this area are maintained by the Project Management and Engineering division of the Municipality of Anchorage's Public Works (PW) Department and/or the Alaska Department of Transportation. According to a storm drain map obtained from PW, the catchments at East 2nd Avenue and Gambell Street connect to a generally northerly flowing storm drain line. This storm drain line discharges directly to Ship Creek at the northern terminus of Eagle Street, approximately 1,800 feet from the site, which represents the PPE for the 15-mile TDL (Figure 3-3) (PW 2011). The average annual flow rate for Ship Creek, as measured at the Elmendorf Air Force Base Power Plant from 1971 to 1980, was 144 cubic feet per second (USGS 2011). Due to the presence of a dam, tidal influences on Ship Creek are limited to the lower approximately 0.5 mile of the waterway. That dam is located approximately 650 feet downstream of the PPE.

From the discharge point at the end of Eagle Street, the 15-mile TDL extends northwest for approximately 0.6 mile to Ship Creek's confluence with Knik Arm, then extends approximately 10.4 miles to the northeast to Goose Bay (north side of Knik Arm), Eagle Bay (south side of Knik Arm), and Eagle River Flats (at Eagle Bay). The 15-mile TDL also extends to the west-southwest in Cook Inlet/Knik Arm for 12.5 miles. In addition to the westerly extension, at 6.7 miles, the 15-mile TDL reaches south to Turnagain Arm. The 15-mile TDL concludes in radial arcs approximately 12.7 miles to the northeast in Knik Arm, 12.7 miles to the west-southwest in Cook Inlet/Knik Arm, and 5.9 miles to the south in Turnagain Arm. The depths of these areas range from less than one foot in "mud-flat" areas to up to 66 feet in navigable channels within Cook Inlet (NOAA 2006).



All of these water bodies qualify as coastal tidal zones. Numerous creeks, streams, and rivers discharge to these coastal tidal zones within the 15-mile TDL.

3.2.2 Ground Water to Surface Water Discharge

The chlorinated solvent plume originating at the site has been identified as a potential source of VC identified in ground water at area GW 2/3 of the TR property. That area of impact is located more than 1,300 feet from the FGPL site and is mapped to include more than 500 feet of frontage along Ship Creek (CH2 2008). Information regarding the full extent of that plume has not been located; however, others have speculated that the plume "may extend to Ship Creek" (ENSR/AECOM 2008).

3.2.3 Drinking Water Targets

Surface water is not used as a drinking water source within the 15-mile TDL for the site. Additionally, surface water is not used as a resource (e.g., irrigation of 5 or more acres of commercial food or forage crop, commercial livestock, or as an ingredient in commercial food preparation) within the 15-mile TDL. Also, there are no major or designated water recreation areas, nor is surface water considered usable for drinking water purposes within the 15-mile TDL

3.2.4 Human Food chain Targets

Sport Harvest

Sport fishing is known to occur within the 15-mile TDL. Sport catch harvest data were obtained from reports prepared by the Alaska Department of Fish and Game (ADFG). Two sport fishing management areas (MAs) are present within the 15-mile TDL, the Northern Cook Inlet MA (NMA) and the Anchorage MA (AMA).

Sport fish catch data in the AMA are partitioned out by species and fresh water body (e.g., lake, creek, river), and also include a separate "saltwater" harvest category (ADFG 2010a). The saltwater fish harvest category includes fish caught below the mean low-tide level at the mouths of Six Mile Creek and Ship Creek (Bosch 2011), both of which are located within the 15-mile TDL. On Ship Creek, fishing is permitted from the creek mouth to 100 feet below the "Chugach Power Plant Dam," all of which is located within the 15-mile TDL.

With respect to the NMA, tabulations are broken down by drainage basin, with the sport catch in these basins reported by the fisheries within them (e.g., stream, creek, river, or lake). The NMA does not include a subcategory for saltwater catch (ADFG 2010b). Of these catch and reporting areas, only the Little Susitna River fishery is located within the 15-mile TDL. According to Mr. Sam Ivey of ADFG, the intertidal zone on this river extends approximately 5 miles upstream from the Cook Inlet. Approximately one-quarter to one-third of the sport fish harvest from this river occurs within the intertidal zone (Ivey 2011). The START estimates that less than 5 percent of the Little Susitna intertidal zone is present within the 15-mile TDL.



Sport harvest data are presented as the number of fish harvested. To calculate the total pounds of fish harvested within the TDL, START multiplied the number of fish harvested within the 15-mile TDL in the AMA (i.e., "saltwater" catch and Ship Creek) by the average weight of each fish species. For the NMA, the total harvest from the Little Susitna River was multiplied by the estimated catch percentage obtained within the 15-mile TDL (1.25 percent). START then multiplied the number of fish harvested within this portion of the NMA by the average weight of each fish species. The most recent sport harvest data available from each management area (2009 for AMA and 2008 for NMA) are indexed by fish species and specific catch area, and presented in Tables 3-2 and 3-3.

Subsistence and Commercial Harvest:

Although tribal subsistence fishing and shell fish harvest occur on the Cook Inlet, the areas where subsistence harvest occurs are outside of the 15-mile TDL (Cunningham 2011).

Commercial fishing occurs within the 15-mile TDL. Commercial fishing data were obtained from the 2010 annual management report for the Upper Cook Inlet Commercial Fishery prepared by the ADFG (ADFG 2010c).

For the purposes of monitoring and reporting, the Upper Cook Inlet is divided into northern and southern districts, which are then divided into smaller subdistricts. Reporting in these subdistricts references smaller, individual "statistical areas." The 15-mile TDL is located completely within the "general subdistrict" of the Upper Cook Inlet Management Area's northern district (ADFG 2010c). While five of the general subdistrict's statistical areas are located in the 15-mile TDL, only three of those statistical areas (247-41, 247-42, and 247-43) were open for harvest in 2010. START estimates that the 15-mile TDL encompasses 10 percent of the 247-41, 100 percent of the 247-42, and 50 percent of the 247-43 statistical areas.

In 2010, five species of salmon harvest was reported to have occurred in the 15-mile TDL. These included Chinook (*Oncorhynchus tshawytscha*), Sockeye (*Oncorhynchus nerka*), Coho (*Oncorhynchus kisutch*), Pink (*Oncorhynchus gorbuscha*), and Chum (*Oncorhynchus keta*) salmon. Commercial harvest data are presented as the number of fish harvested (ADFG 2010c). To calculate the total pounds of fish harvested within the TDL, START multiplied the number of fish harvested in the catch reporting areas by the percentage of that reporting area located within the 15-mile TDL. START then multiplied the number of fish harvested within catch reporting areas by the average weight of each fish species. Commercial harvest data, by fish species, are presented in Table 3-4.

While the commercial harvest of razor clams (Siliqua patula), Pacific herring (Clupea pallasi), and smelt (Thaleichthys pacificus) does occur within the Upper



Cook Inlet, areas where such harvest is permitted are beyond the 15-mile TDL (ADFG 2010c).

3.2.5 Environmental Targets

Based on information obtained from the United States Fish and Wildlife Service (USFWS), the federal-listed endangered leatherback sea turtle (*Dermochelys coriacea*), stellar sea lion (*Eumetopia jubatus*), Eskimo curlew (*Numenius borealis*), bowhead whale (*Balaena mysticetus*), finback whale (*Balaenoptera physalus*), and humpback whale (*Megaptera novaeangliae*) are present within the 15-mile TDL (USFWS 2011). Further, the state-listed endangered North Pacific right whale (*Eubalaena japonica*) is also present within the 15-mile TDL (ADFG 2011).

Based on National Wetlands Inventory maps, it is estimated that approximately 16 miles of wetland frontage exists along Ship Creek, Cook Inlet, Knik Arm, and Turnagain Arm within the 15-mile TDL (Hanson 2011). Wetland frontage by surface water body is as follows:

•	Ship Creek	0.08 mile (436 feet)
•	Eagle Bay	0.3 mile
=	Eagle River Flats	4.1 miles
•	Goose Bay	0.8 mile
•	Knik Arm	8.5 miles
	Turnagain Arm	2.3 miles

Additionally, the Alaska Coastal Wildlife Refuge, Susitna Flats Game Refuge, and Goose Bay State Game Refuge are present within the 15-mile TDL (ADFG 2011). No state designated critical habitat areas were identified within the 15-mile TDL.

3.3 Soil Exposure Pathway

The soil exposure pathway is evaluated based on the threat to residents and nearby populations from soil contamination within the first 2 feet of the surface.

3.3.1 Site Setting and Exposed Sources

The site includes 40,600 square feet of predominantly gravel covered, undeveloped land used only for parking. Two small concrete foundation pad relics from earlier on-site development remain on the east margin of the site. Apart from the fence surrounding an on-site cellular communications tower, the site is not fenced and does not include access limitations. During previous investigations, soil samples collected from 0 to 2 feet beneath the ground surface

3. Migration/Exposure Pathways

on the FGPL contained PCE at concentrations ranging from 1.35 to 13.2 ppm. "J" data qualifiers were assigned to all of the data from shallow soil samples to indicate the results were "potentially biased low" (BGES 2007). Field screening during previous sampling events has also revealed surficial soil impacts by chlorinated solvents at three locations on the northern adjacent residential property (Oasis 2008).

3.3.2 Targets

There are no employees at the site, nor are any schools or day care facilities located on site. Eight separate residential dwelling units are however located within 200-feet of surficial soil (i.e., 0 to 2 feet bgs) in which PCE has been detected. Again, these detections include five locations where laboratory analysis detected PCE in shallow soils on the FGPL site and three locations on the northern adjacent residential lots where field screening with Color-Tec devices detected VOCs. In 2000, the average household size was 2.67 people (USDOC 2000) resulting in a total "source" population of 21.36 people (8 residences x 2.67 people per residence). Approximately 13,461 people reside or attend school within a 1-mile travel distance of the site. Population by distance ring, including students and teachers, is presented in Table 3-5.

The nearest residence is located approximately 30 feet north of the FGPL property. Approximately 13,461 people reside or attend school within a 1-mile travel distance of the site. Population by distance ring, including students and teachers, is presented in Table 3-5.

No resources such as commercial agriculture, livestock production or grazing, or commercial silviculture occur on site. Additionally, no terrestrial sensitive environments are present on site.

3.4 Air Migration Pathway

The air migration pathway TDL is a 4-mile radius that extends from sources at the site (Figure 3-1).

3.4.1 Human Targets

There are approximately 107,875 people residing within the 4-mile TDL (Hanson 2011). There are also a total of 32 schools located within the 4-mile TDL, with a total student and teacher population of approximately 36,406 (National Center for Education Statistics [NCES] 2011). This number excludes Mount Iliamna School, for which student and teacher information could not be located.

As discussed in section 2.5.7, both PCE and TCE have been detected in outdoor ambient air samples collected from the residential properties adjacent to the north of the FGPL property. These airborne detections coincide with locations where elevated PCE concentrations have been detected in soil gas samples, and constitute an observed release. As PCE has also been detected in soil vapor samples collected up to approximately 500-feet from the FGPL property, the

3. Migration/Exposure Pathways

START conservatively estimates that workers and residents within an approximate 350-foot radius of the center of the C and K Cleaners represent the target population exposed to actual contamination (Figure 3-4).

Using this radius, the following populations are assumed present:

Thirteen residences:	34.71	(13×2.67)
■ Three businesses with 5 employees:	15	(3×5)
One business with 20 employees:	20	(1 x 20)
One business with 30 employees:	30	(1×30)
Total:	99.71	

The population subject to potential contamination within the 4-mile TDL, including students and teachers, is presented in Table 3-5.

3.4.2 Environmental Targets

Neither silviculture nor commercial agriculture occurs within 0.5 mile of potential sources at the site. Three designated recreational areas, Fairview Lions Park, Buttress Park, and Fairbanks Park, are located within 0.5 mile of the site.

Based on information obtained from the USFWS, the federal-listed endangered leatherback sea turtle (*Dermochelys coriacea*); stellar sea lion (*Eumetopia jubatus*); Eskimo curlew (*Numenius borealis*); bowhead whale (*Balaena mysticetus*); finback whale (*Balaenoptera physalus*); humpback whale (*Megaptera novaeangliae*); and wood bison (*bison athabascae*) are present within the 4-mile TDL (USFWS 2011). The only state-listed endangered species present within the 4-mile TDL is the North Pacific right whale (*Eubalaena japonica*) (ADFG 2011).

An estimated 1,356 acres of wetlands are present within the 4-mile TDL (Hanson 2011). The nearest wetland to the site is located approximately 1,800 feet north-northwest of the site, on the southern side of Ship Creek. Wetland acreage by distance ring is presented in Table 3-6.

4

Summary and Conclusions

The FGPL property is a 40,600-square-foot area of land located within downtown Anchorage, Alaska. Occupants of buildings previously located on the western and eastern portions of the site included C and K Cleaners (1968 to 1970) and NC Tire Center (1976 to 1978), respectively (Oasis 2008). By 1978, these structures had been demolished, with the property used as a gravel surfaced parking lot since that time. During the START site visit, portions of the NC Tire Center building foundations were observed to still be present at the site.

Between 1997 and 2008, numerous phases of subsurface investigation occurred at the FGPL property including the advancement of various test pits; test trenches; soil borings; ground water monitoring wells; and the removal of USTs and belowground hydraulic hoists. During test pit explorations, four buried drums of "dry cleaning solvent" were encountered near the former C and K Cleaners. Two wooden below ground wood/log cribs, interpreted to be discharge points for wastewater collection systems, were also identified near the former dry cleaner and tire/vehicle repair buildings.

Analysis of samples collected during these investigations has revealed significant concentrations of PCE in soil and ground water. These impacts have been documented beneath much of the FGPL property, extending onto the northern adjacent residential properties. The FGPL site has also been identified as a likely contaminant source for chlorinated hydrocarbons detected in ground water at area GW 2/3 of the ARRC. Area GW 2/3 is located more than 1,300 feet north of the site. Ground water impacts at Area 2/3 are suspected to extend to the Ship Creek; however, such surface water impacts have not been confirmed.

At a minimum, approximately 5,284 people are interpreted to use ground water drawn from within the 4-mile TDL. While four AWWU supply wells are located within the 4-mile TDL, only three (Wells 4, 7, and 12) were used in 2010. Those wells are located approximately 1.5 miles (Well 4), 2.4 miles (Well 7), and 2.6 miles (Well 12) from the FGPL site, in inferred cross- to up-gradient hydrologic positions. Contaminants potentially related to the site have not been identified in this drinking water supply.

Other potential targets include the nearby resident population, along with sensitive environments, and aquatic food-chain species. Approximately 144,281 people reside or attend school within 4 miles of the site. Based on ADFG information, 128,829 pounds of fish were harvested within the 15-mile TDL in 2010, 58,220 pounds of which were from Ship Creek. Eight state- and/or federal-listed endangered species are located within the 4-mile and 15-mile TDLs.

4. Summary and Conclusions

Additionally there are approximately 16 miles of wetland frontage along the 15-mile TDL and 1,356 acres of wetlands located within the 4-mile TDL.

Chlorinated solvent contamination (PCE, TCE, VC, etc.) has been confirmed in surface soils, subsurface soils, ambient air, and ground water at the site. This contamination appears to be migrating to the north toward Ship Creek and may be impacting sensitive environments in that water body. In total, 21.36 residents are interpreted to reside within 200-feet of documented surface soil impacts; and 99.71 residents and employees are interpreted to be located within the 350-foot radius of actual air contamination.

5

References

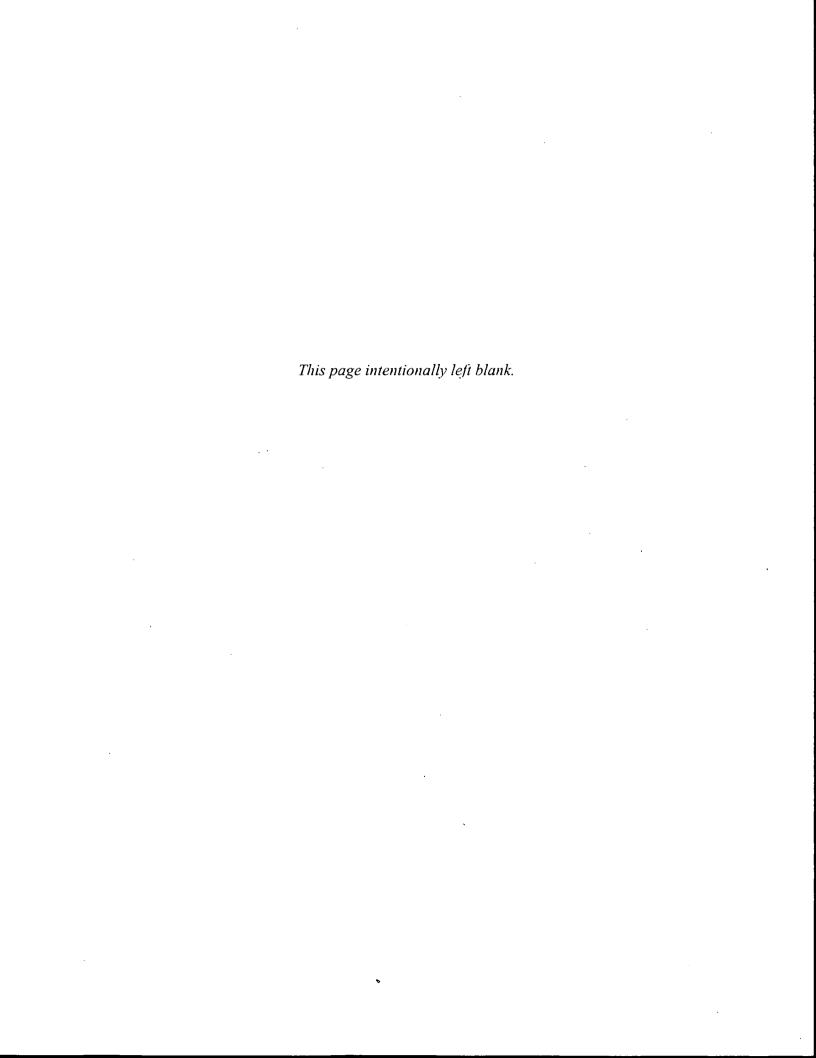
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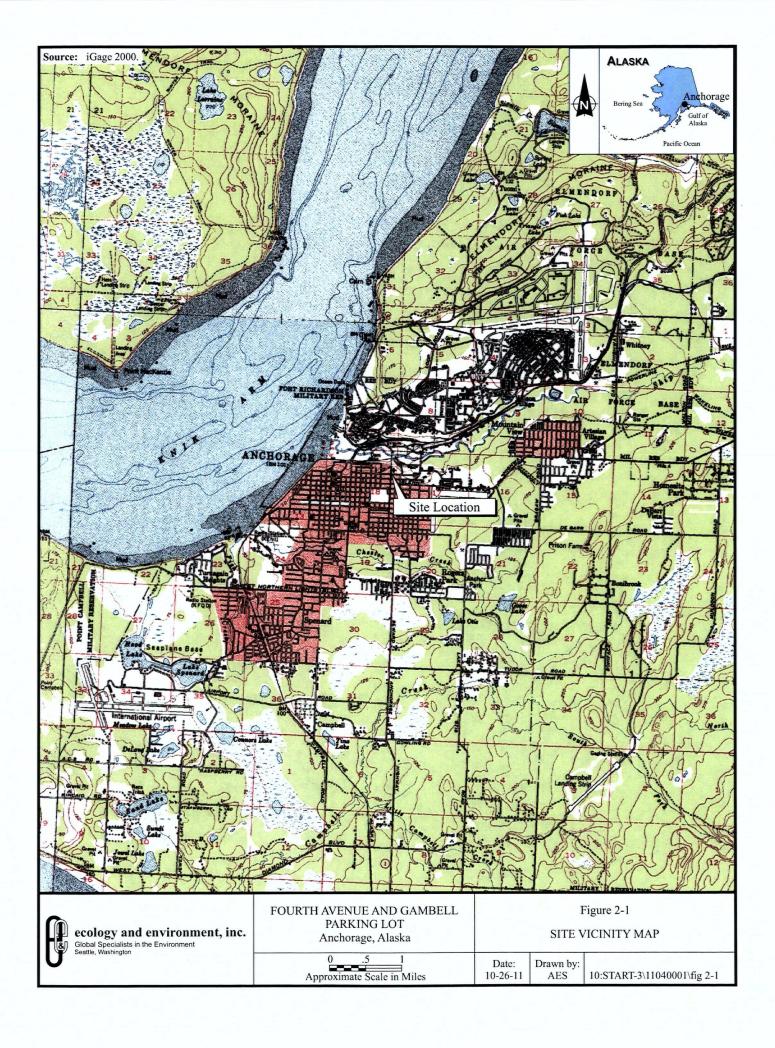
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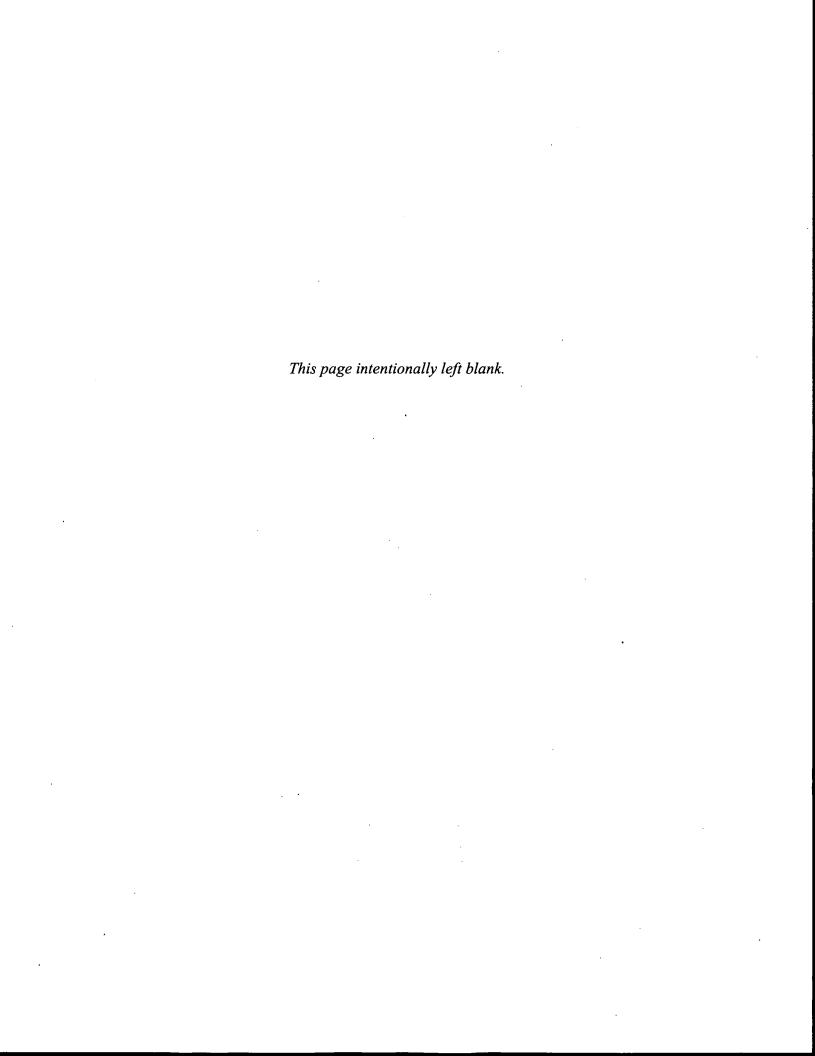
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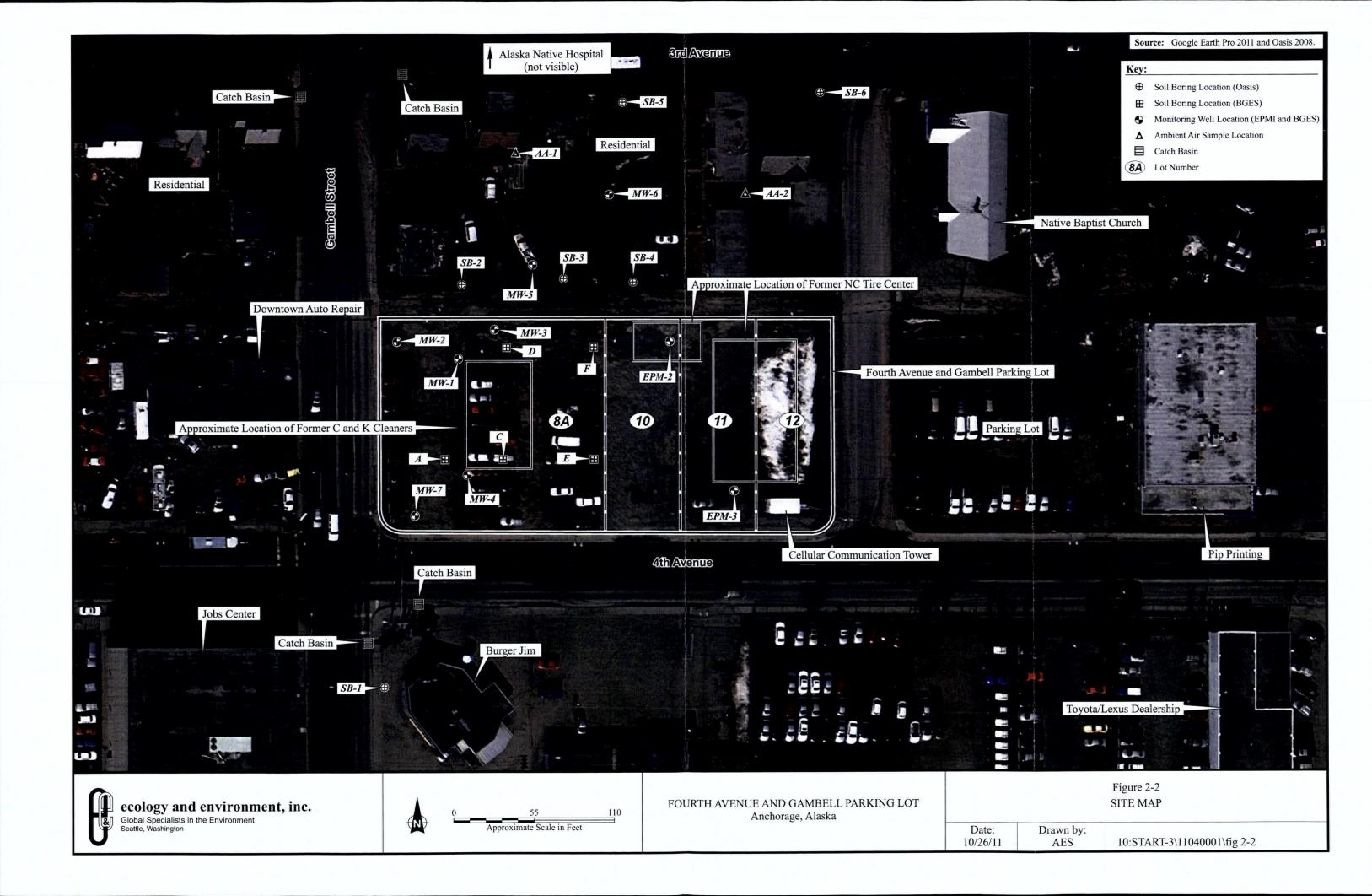
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Figures

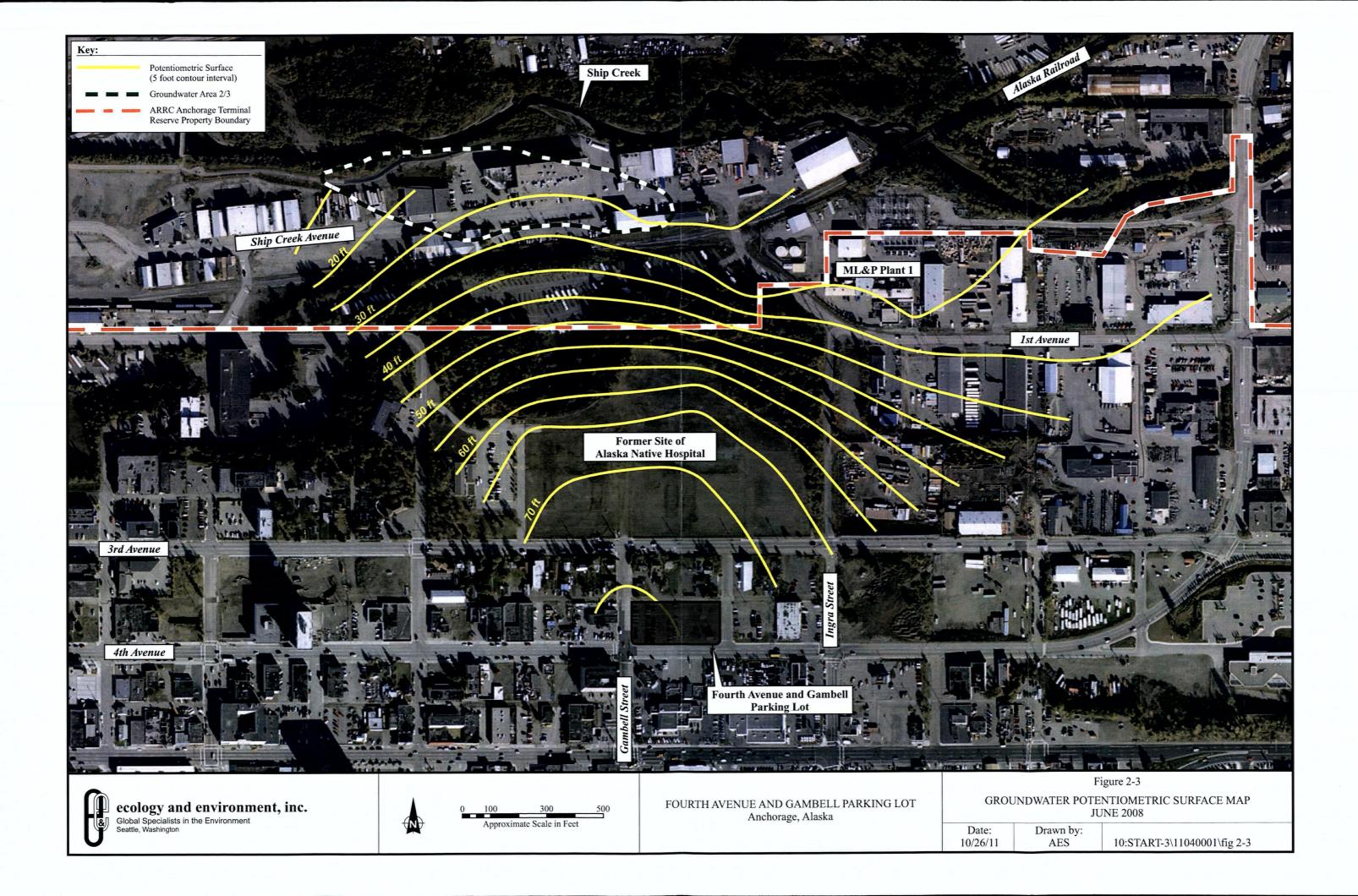


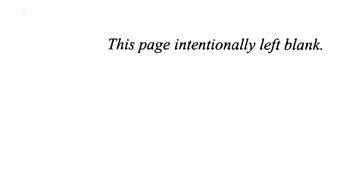


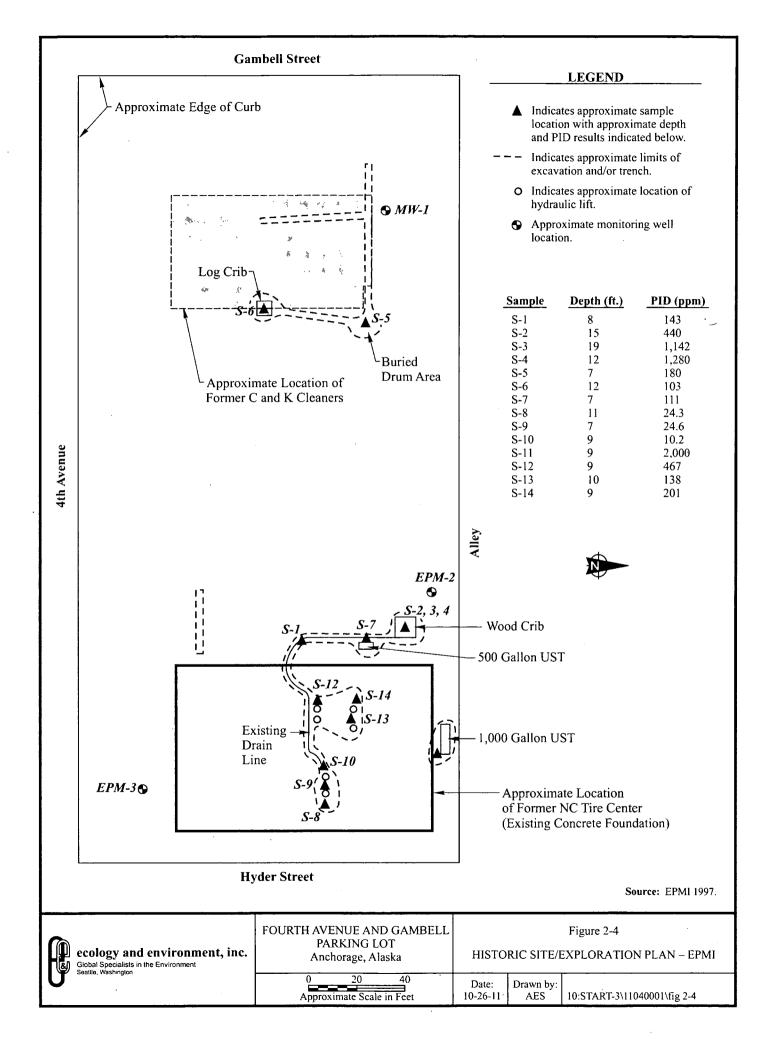


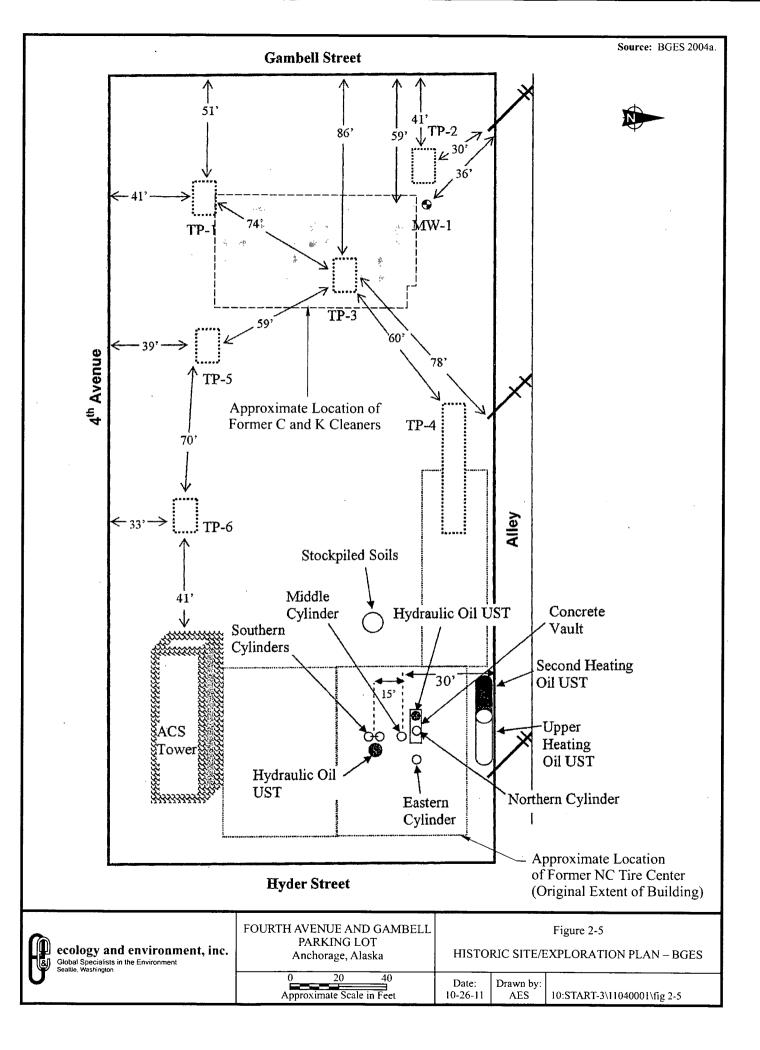


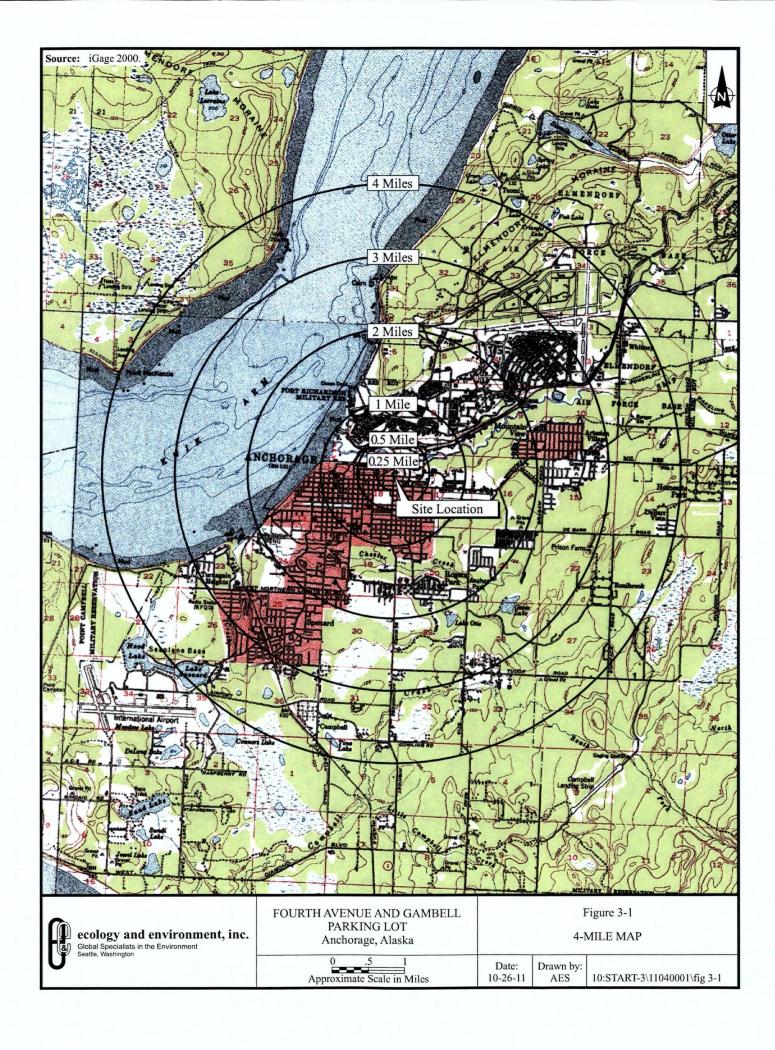


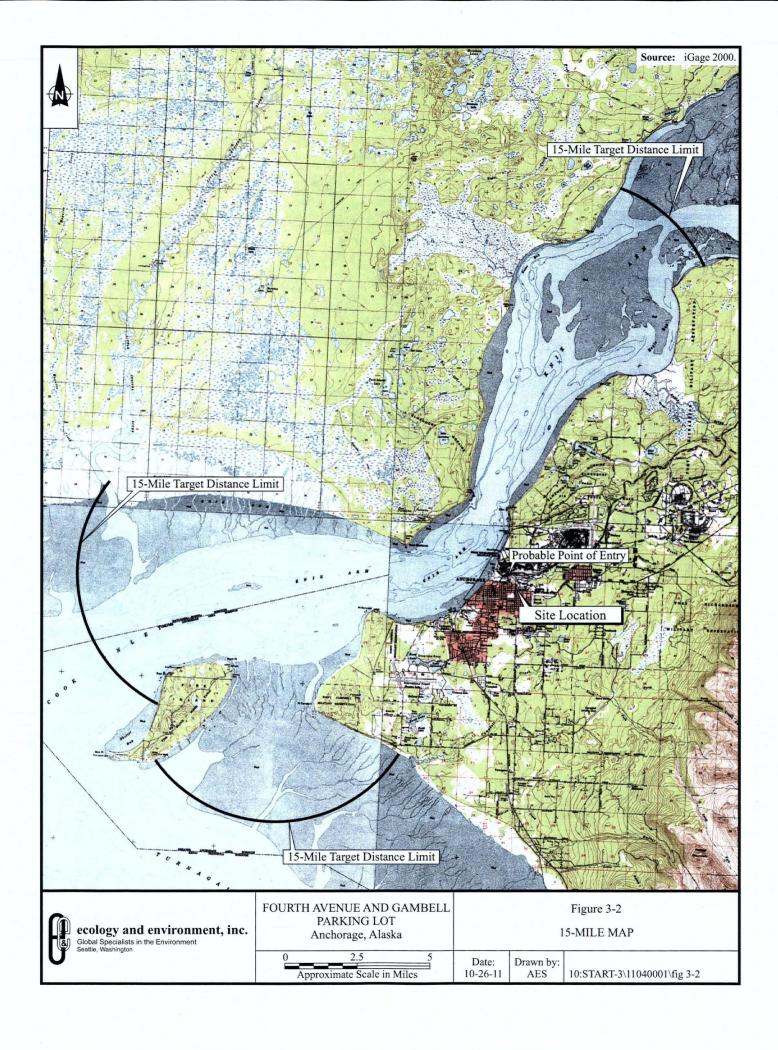


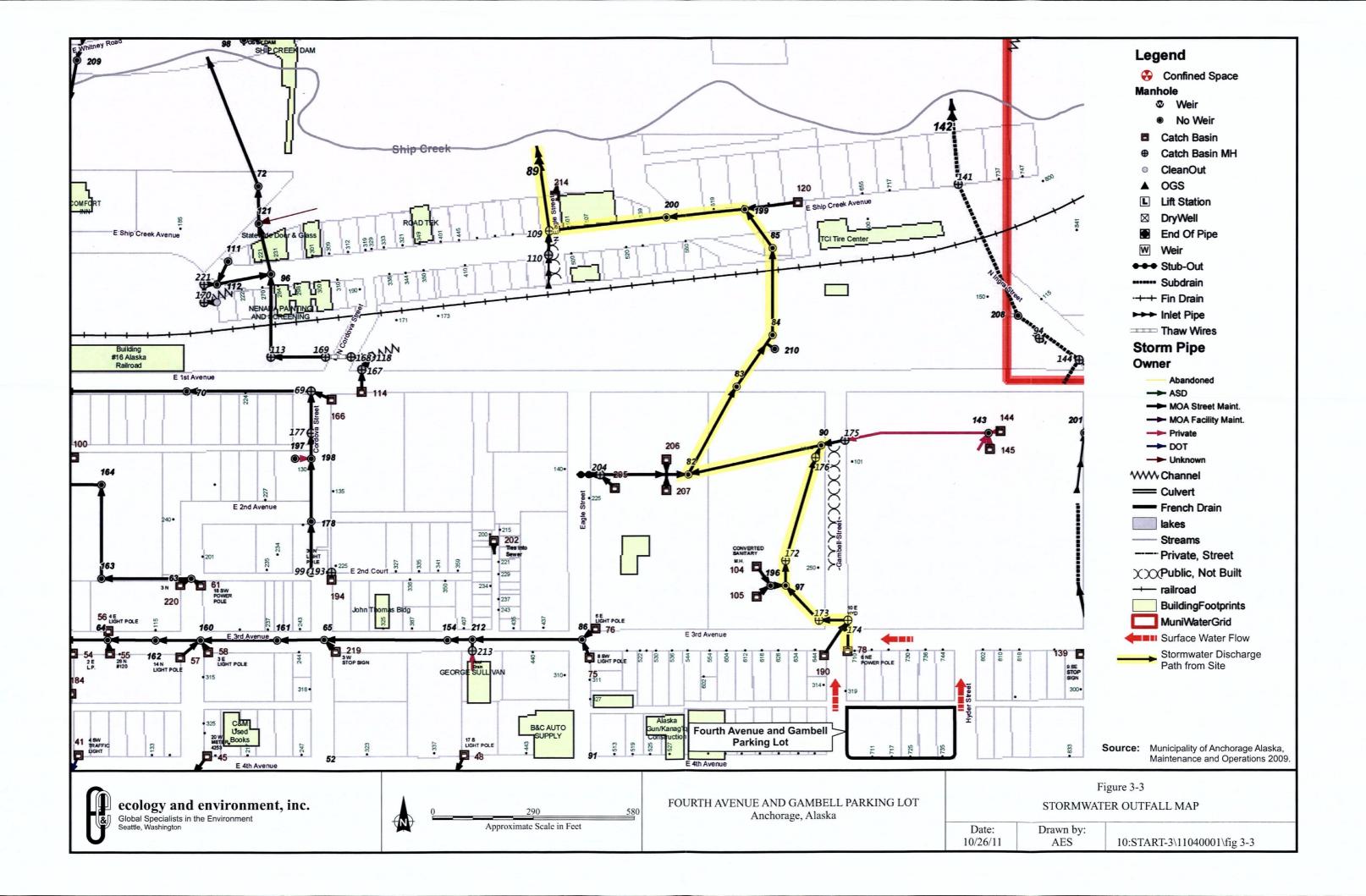


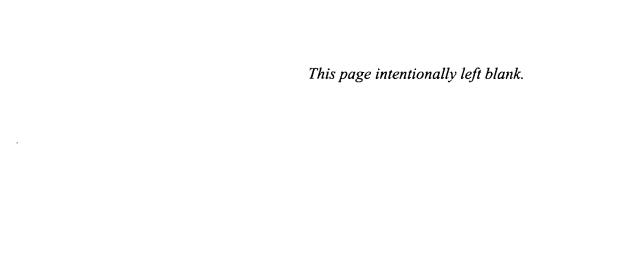


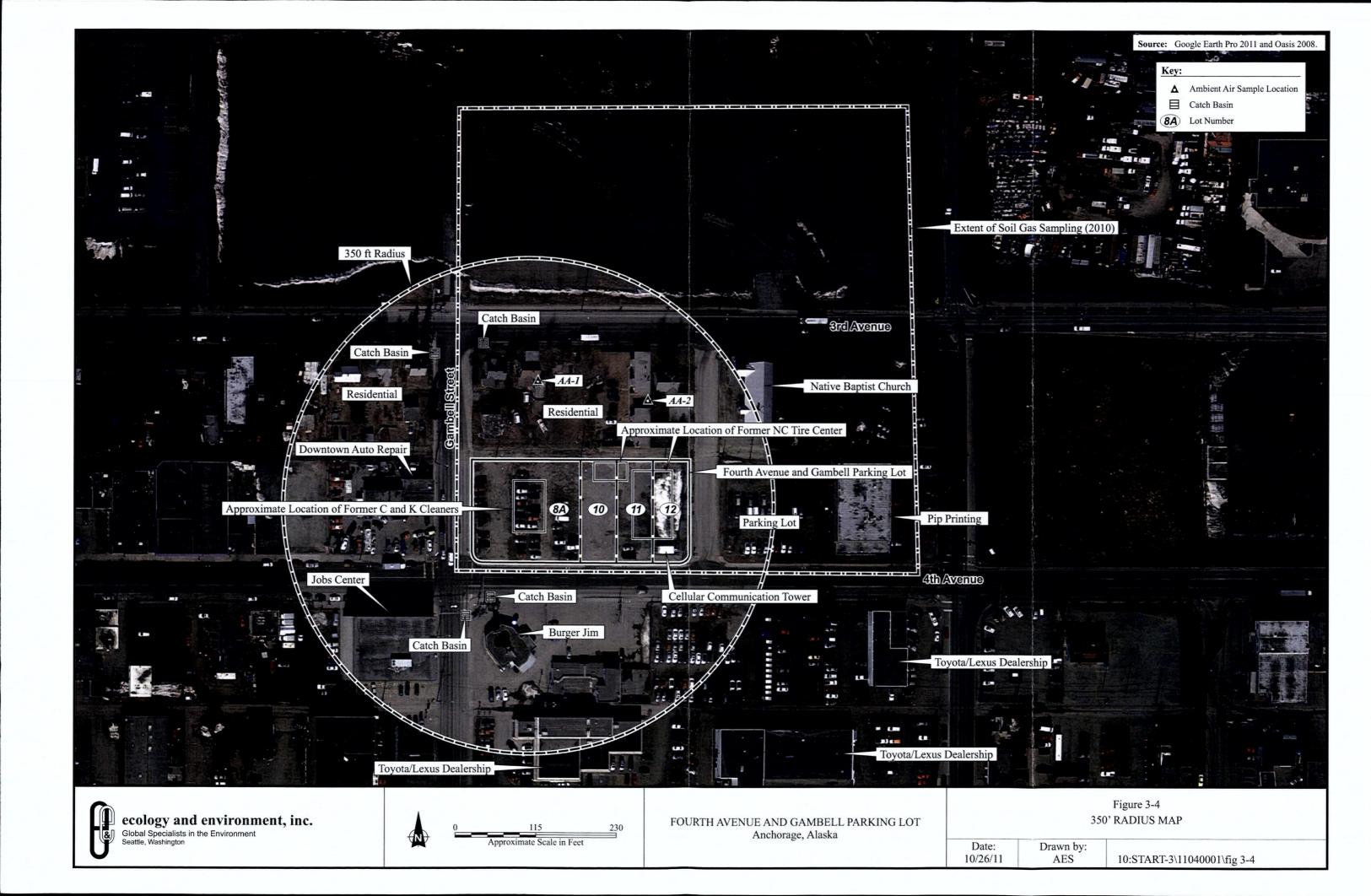














Tables

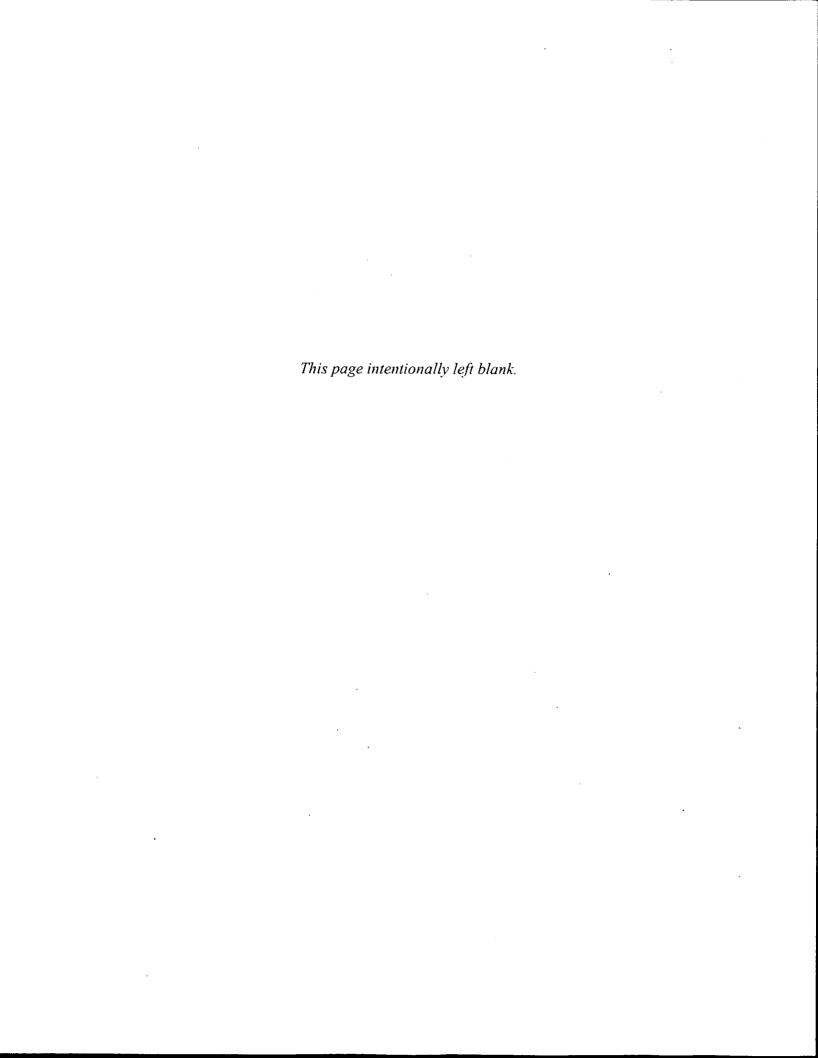


Table 3-1 Ground Water Drinking Water Population

🐐 Ring 🛪	Number of Wells	Population	Total Population per Distance Ring
0 - 1/4	None		
1/4 - 1/2	Domestic – 1	2.67	2.67
1/2 - 1	None		
1 – 2	Municipal – 1	733.9	733.9
2 – 3	Municipal – 2	4,550.3	4,550.3
3 – 4	None		
TOTAL			5,286.9

Sources: DOC 2001; ADNR 2011, AWWU 2011.

Note: Domestic well populations were estimated based on the average number of persons per household for the borough in which the well is located. The average population per household for the Municipality of Anchorage Borough is 2.67.

Table 3-2 AMA Sport Harvest Data within the 15-mile TDL

No. of the second	Number Number Salt Water in AMA	Harvested From	Average Pounds per Fish	Pounds Harvested
Chinook Salmon (Oncorhynchus tshawytscha)	143	884	22	22,594
Coho Salmon (Oncorhynchus kisutch)	207	2,974	10	31,810
Pink Salmon (Oncorhynchus gorbuscha)	79	785	4	3,456
Sockeye Salmon (Oncorhynchus nerka)	0	NR	· 	0
Chum Salmon (Oncorhynchus keta)	0	40	9	360
TOTAL				58,220

Sources: Wydoski and Whitney, 2003; ADFG 2010a

NR = Not Reported

AMA = Anchorage Management Area

Table 3-3 NMA Sport Harvest Data within the 15-mile TDL

* Species * *	Number Harvested From Little Susitna River (NMA)	Number Harvested From Little Susitna River X 1.25%	Average Pounds per Fish	Pounds Harvested
Chinook Salmon (Oncorhynchus tshawytscha)	1,653	20.7	22	455.4
Coho Salmon (Oncorhynchus kisutch)	13,498	168.7	10	1687
Pink Salmon (Oncorhynchus gorbuscha)	NR	- -	4	
Sockeye Salmon (Oncorhynchus nerka)	1,699	21.2	8	169.6
Chum Salmon (Oncorhynchus keta)	NR			0
TOTAL				2,312

Sources: Wydoski and Whitney, 2003; ADFG 2010b

NR = Not Reported

NMA = Northern Cook Inlet Management Area

Table 3-4 Commercial Harvest Data within the 15-mile TDL

Species *	Number Harvested From Area 247-41	Number Harvested From Area 247- 41 x 10%	Number Harvested From Area 247- 42 x 100%	Number Harvested From Area 247- 43	Number Harvested From Area 247-43 x 50%	Average Pounds per Fish	Pounds Harvested
Chinook Salmon (Oncorhynchus tshawytscha)	127	12.7	192	180	90	22	6,483.4
Coho Salmon (Oncorhynchus kisutch)	2,170	217	2,944	2,517	1,258.5	10	4,419.5
Pink Salmon (Oncorhynchus gorbuscha)	94	9.4	5	1	0.5	4	59.6
Sockeye Salmon (Oncorhynchus nerka)	2,678	267.8	4,904	1,895	947.5	8	48,954.4
Chum Salmon (Oncorhynchus keta)	374	37.4	429	485	242.5	9	6,380.1
TOTAL							66,297

Sources: Wydoski and Whitney, 2003; ADFG 2010c

Note: The pounds harvested figure was calculated by adding up the total harvest of each individual species within the 15-mile TDL (i.e., 10% of Area 247-41 harvest + 100% of Area 247-42 harvest + 50% of Area 257-43 harvest) and multiplying this total by the average fish weight of the given species.

Table 3-5 Population within 4 Miles

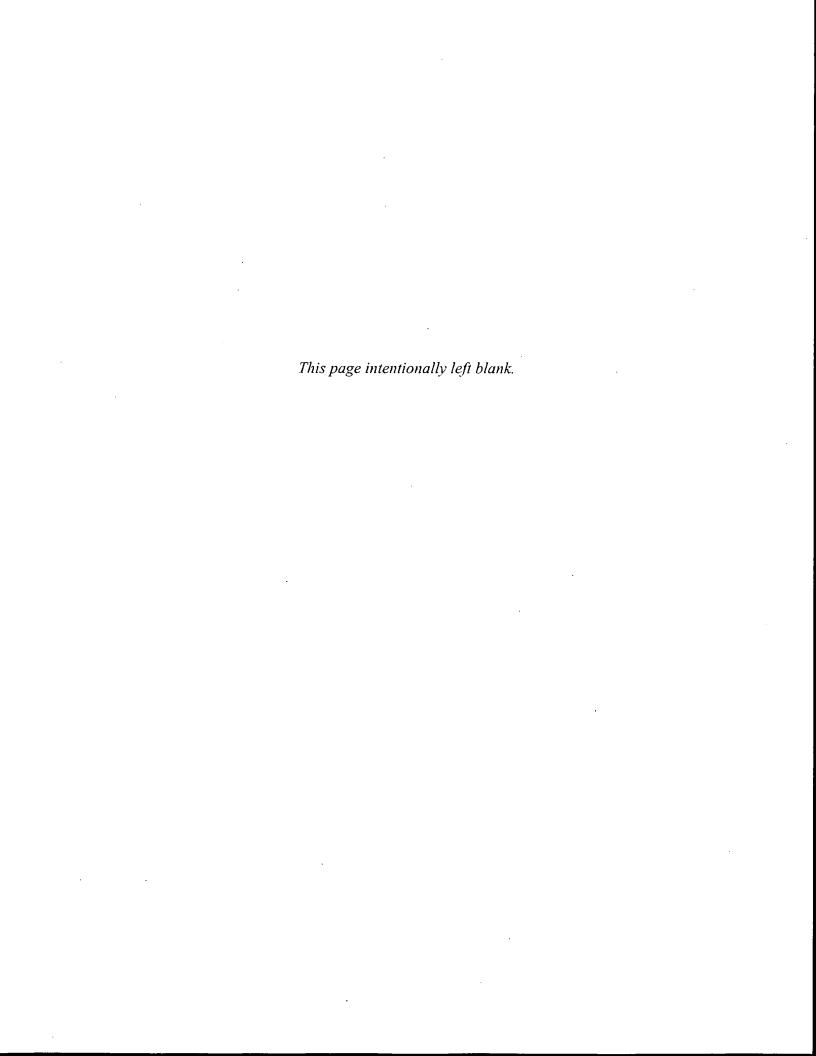
Distance (miles)	Resident Population	Student/ Teacher Population	Total Population by Distance Ring
On a source	0	0	0
$0 - \frac{1}{4}$	420	0	420
$\frac{1}{4} - \frac{1}{2}$	2,101	0	2,101
$\frac{1}{2} - 1$	8,611	2,308.4	10,919.4
1 to 2 miles	23,465	3,757.3	27,222.3
2 to 3 miles	35,732	27,477	63,209
3 to 4 miles	37,546	2,864.1	40,410.1
TOTAL	107,875	36,406.8	144,281.8

Source: Zawistoski 2011; NCES 2011

Table 3-6 Wetland Acreage within 4 Miles

Distance (miles)	Wetland Acreage
$0 - \frac{1}{4}$	0
$\frac{1}{4} - \frac{1}{2}$	5.1
1/2 - 1	3.4
1 to 2 miles	165.8
2 to 3 miles	363.6
3 to 4 miles	818.1
TOTAL	1,356

Source: Zawistoski 2011





Photographic Documentation

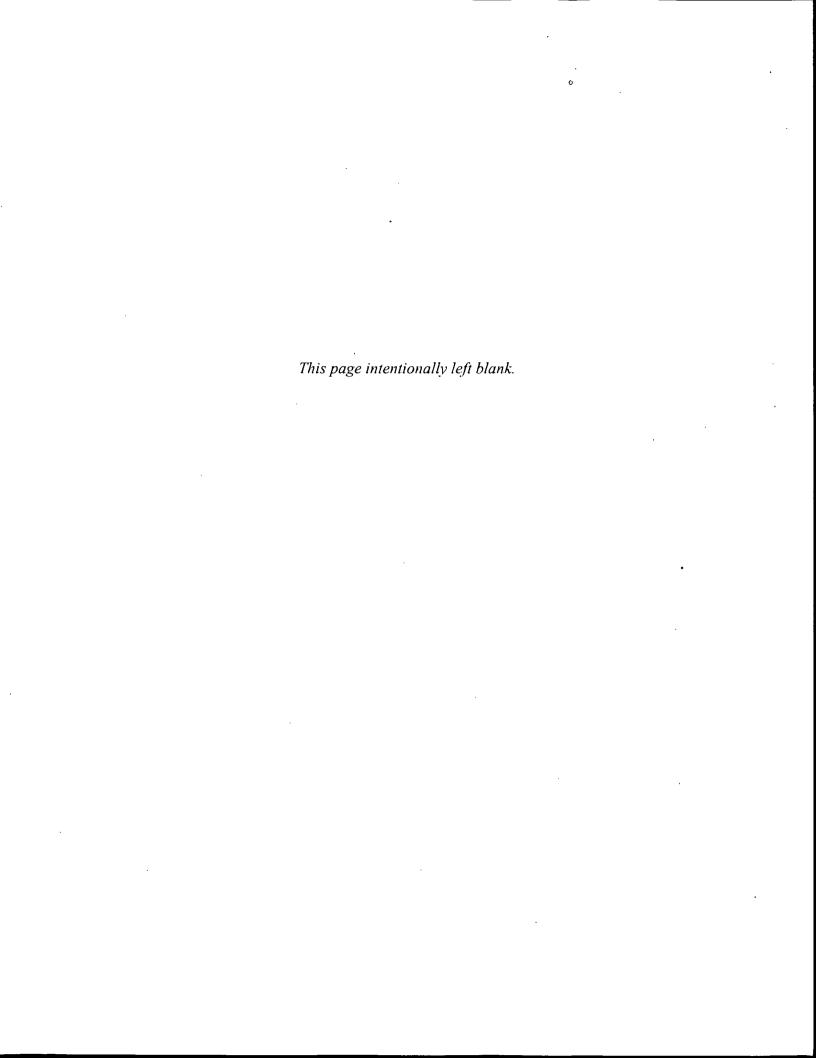




Photo 5 Reported location of MW-7(not visible).

Direction: Northeast Date: 7/18/11 Time: 15:06



Photo 7 MW-2 well monument damaged. Portion of white plastic cap visible.

Direction: Date: 7/18/11 Time: 15:11

TDD Number: II-04-000l Photographed by: Derek Pulvino



Photo 6 MW-4 visible, located in a parking spot.

Direction: Northeast Date: 7/18/11 Time: 15:07



Photo 8 MW-1 with broken monument cap.

Direction: Date: 7/18/11 Time: 15:12



Photo 1 Looking west-northwest from southeast corner of site.

Direction: West-Northwest Date: 7/18/11 Time: 14:51



Photo 3 Reported location of EPM3 (not visible) facing southeast. Part of foundation for former tire store building visible.

Direction: Southeast Date: 7/18/11

Time: 14:55

TDD Number: II-04-000l Photographed by: Derek Pulvino



Photo 2 Looking east from southeast corner of site.

Direction: East Date: 7/18/11 Time: 14:51



Photo 4 Reported location of EPM2 (not visible). Concrete slab for former building present.



Photo 13 Residences north of west portion of site.

Direction: Northwest Date: 7/18/11 Time: 15:17



Photo 15 Looking east from intersection of Hyder and 3rd.

Direction: East Date: 7/18/11 Time: 15:20

TDD Number: II-04-000l Photographed by: Derek Pulvino

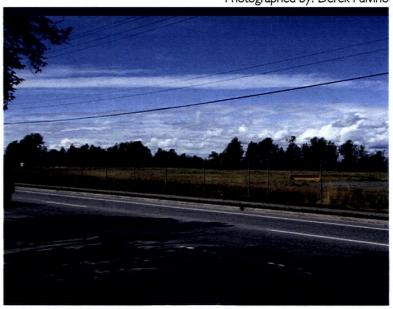


Photo 14 Property north of 3rd - previously occupied by Alaska Native Hospital.

Direction: North Date: 7/18/11 Time: 15:20



Photo 16 Looking west-southwest from 3rd and Gambell.

Direction: West-Southwest Date: 7/18/11 Time: 15:22



Photo 9 Facing west from north central portion of site. MW-3 is reportedly located in this area (not visible).

Direction: West

Date: 7/18/11

Time: 15:15



Photo 11 MW-6 on adjacent residential property, facing northeast from site.

Direction: Northeast Date: 7/18/11 Time: 15:16

TDD Number: 11-04-000l Photographed by: Derek Pulvino



Photo 10 MW-5 looking north from site. Well is on adjacent residential parcel.

Direction: North

Date: 7/18/11

Time: 15:16



Photo 12 Residences north of east portion of site.



Photo 17 Looking east-southeast from northwest corner of site.

Direction: East-Southeast Date: 7/18/11 Time: 15:23

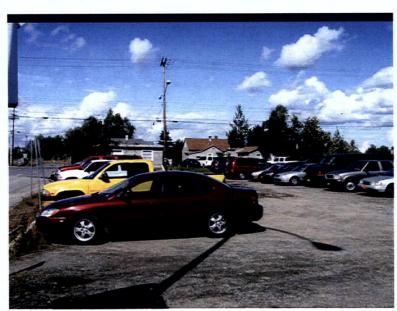


Photo 19 Looking north from southwest corner of site.

Direction: North Date: 7/18/11 Time: 15:26

TDD Number: II-04-000l Photographed by: Derek Pulvino



Photo 18 Looking west-northwest from southwest corner of site.

Direction: West-Northwest Date: 7/18/11 Time: 15:25



Photo 20 Looking northeast from southeast corner of site.



Photo 21 Looking north from center of site.

Direction: North Date: 7/18/11 Time: 15:27

TDD Number: II-04-000l Photographed by: Derek Pulvino

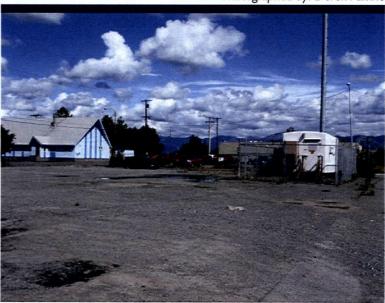


Photo 22 Looking northeast from center of site.